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Electricity in Film Production

IN many industries electricity provides a better means of performing work that could be done, however less efficiently, in other ways. Modern cinematography, however, may be said to owe its very existence to electricity, which, in addition to the part it plays in sound recording, makes practicable the high intensities and close control of illumination called for in studio photography.

Luminous intensities tend to increase with every advance in film technique. Thus, in colour photography upwards of 1,500 kW has been used on a single stage, and this heightened standard is having its reaction on black and white work. Arc lamps have found a new field (with a return to favour of automatic carbon-feed), not only on account of their greater individual outputs, but also for the close approximation they give to daylight, which is unequalled for most colour effects by even the remarkably high colour temperatures achieved in incandescent lamps of up to 5 kW. Generally it may be said that rule-of-thumb methods of early film production are giving place to scientific study of the characteristics of studio illuminants.

Sound films require the minimising of voltage ripple, and while experience in design of generators specifically for studio lighting has reduced this to exceedingly small dimensions it remains to be seen whether the present trend of things will not call for supplementary smoothing in the feeders to eliminate undesirable harmonics.

Voltage regulation raises some difficult questions. At the Pinewood Studios, described in this issue, no fewer than 8½ acres is covered by buildings, including 1⅔ acres for the first five studios. To supply four of these at low-voltage, twenty tons of bare aluminium bar has been installed, while to allow for colour photography in the fifth studio ten tons more is required. Possibly further developments may make the use of automatic regulation economical. Among the many good features of the distribution system is the manner in which the stages are fed from overhead gangways, leaving the studio floors clear of cabling.

A different kind of problem is involved in the choice of independent generation on grounds, we are assured, only of comparative cost. Pinewood is one of half a dozen studios we know of in the London area with an aggregate installed capacity of quite 10,000 kW that have adopted this course. There would appear to be nothing peculiar in this class of load that makes it unsuitable for supply from public mains. The load factor is poor, but the load curves we have seen appear to indicate that the intermittent demand should have a considerable diversity with other industrial loads supplied by an undertaking.

The use of waste heat from the Diesels in the form of jacket-cooling water and exhaust gases could not be regarded as a point in favour of private plant in the conditions of running at Pinewood, since its success has been attained only with the aid of load-levelling immersion heaters. These, though enabling electricity to play a considerable part in heating the buildings, only made the cost per 1,000 B.th.u. equal to that obtainable with coal-fired boilers. Full advantage, however, was taken of the opportunity by the Diesel engine makers not only to build units of notable fuel efficiency, but also to match the speedy manner in which the first four studios had been constructed (within twelve months of the clearing of the site). Each of the 750-h.p. Diesels was transported from the works in one 36-ton unit, manœuvred into position by a 12-ton crane, and put into operation a week later.

From these and other considerations discussed in the article it will be clear that, while the applications of electricity in the film-production industry have their special features, they have fundamentally much in common with any other sound piece of engineering work.

Switchgear Operation

A correspondent in this issue, who writes as one exposed to risks, urges the adoption of remote control of high-voltage switchgear. This was one of the most important features of the last report on "Electrical Accidents" of the Chief Electrical Inspector of Factories. In this Mr. H. W. Swann pointed out that, while minimising the danger to operators, remote control did not protect others near a faulty switch or eliminate fire risks, and he emphasised the need for adequate means of egress. The report advocated automatic spring reclosure, which, we believe, can be adapted to existing switchgear. This method meets the case of the hesitant operator, who, with some circuit-breakers, might set up a disastrous "pumping" by making contact through the arcing tips on a fault, equally with that of his more impetuous colleague who, by frequently banging home the switch, exaggerates a mechanical weakness and puts the main contacts out of alignment. At the same time one must not underestimate the extensive character of the switchgear reconstruction that has been carried out in recent years all over the country or the rapid increase in the knowledge of arc phenomena derived from improved facilities for research, such as those provided by switchgear testing stations.

Smaller Discharge Lamps

Present indications are that the mercury-vapour discharge lamp will develop in two ways, *i.e.*, through an increase in gas pressure and through the aid of fluorescent substances. Improvement due to the first is mainly based upon increase in luminous efficiency with watts dissipated for a given length of discharge. The new 80-W and 125-W lamps, which are expected to be available shortly, will, Mr. W. Rule states in his A.S.E.E. paper, have a gas pressure of 10 atm. instead of the 1 atm. now employed, and a luminous efficiency even better than that of the existing 250-W type. Another effect of the increased pressure is to add to the red in the spectrum. The high temperature has necessitated the use of quartz instead of hard glass for the inner container. Quartz transmits ultra-violet rays (as glass does not), opening up possibilities for achieving still greater efficiencies by the re-emission as visible light of the ultra-violet rays absorbed by fluorescent powders within the outer container, and by the use of suitable fluorescent material to control the colour of the light.

The Advance Continues

If the early cold "snap" experienced a few days ago is symptomatic of the type of weather we are to expect during the coming winter, it is evident that the monthly generation figures issued by the Electricity Commissioners will rise well above the 2,000 million kWh mark—in the peak month (January) of last winter 1,970 million kWh was reached. Already the curve which we publish each month has taken on a sharp acclivity, the September output being 1,544 million kWh against 1,332 million kWh in August. The advance over September, 1935, was 16.9 per cent. (223 million kWh), which was slightly higher than the average for the first nine months of the year (15.9 per cent.), but last month contained one more working day than the corresponding month of 1935.

The Wrong Angle

Dealing with the backwardness of the United States in the matter of commercial electric cooking, the *Electrical World* (New York) says that ten years ago the power industry had high hopes of building up a large and profitable business in this field. Unfortunately the industry sent out salesmen who talked about electricity, instead of food, to prospective customers and, naturally, the latter were not interested. Our contemporary points out that a man who is running a restaurant is concerned only with the purchase, preparation, cooking and serving of food and the cost of these processes; he cannot be bothered with electrotechnics. In this country the commercial cooking load is gradually increasing. If "prospects" are talked to in their own language by men qualified to do so the pace will be accelerated.

Coal and the Trolley-Bus

One of the arguments in favour of the electric trolley-bus is that it is independent of imported liquid fuel: that it usually employs energy derived from British coal. This was one of the points put to the Secretary of Mines last week by a deputation from the coal industry, an industry which, from certain other points of view, is not altogether friendly to electricity. The deputation included the battery-driven vehicle in its commendation, as that, too, possesses the same characteristic.

A Wind-driven Station

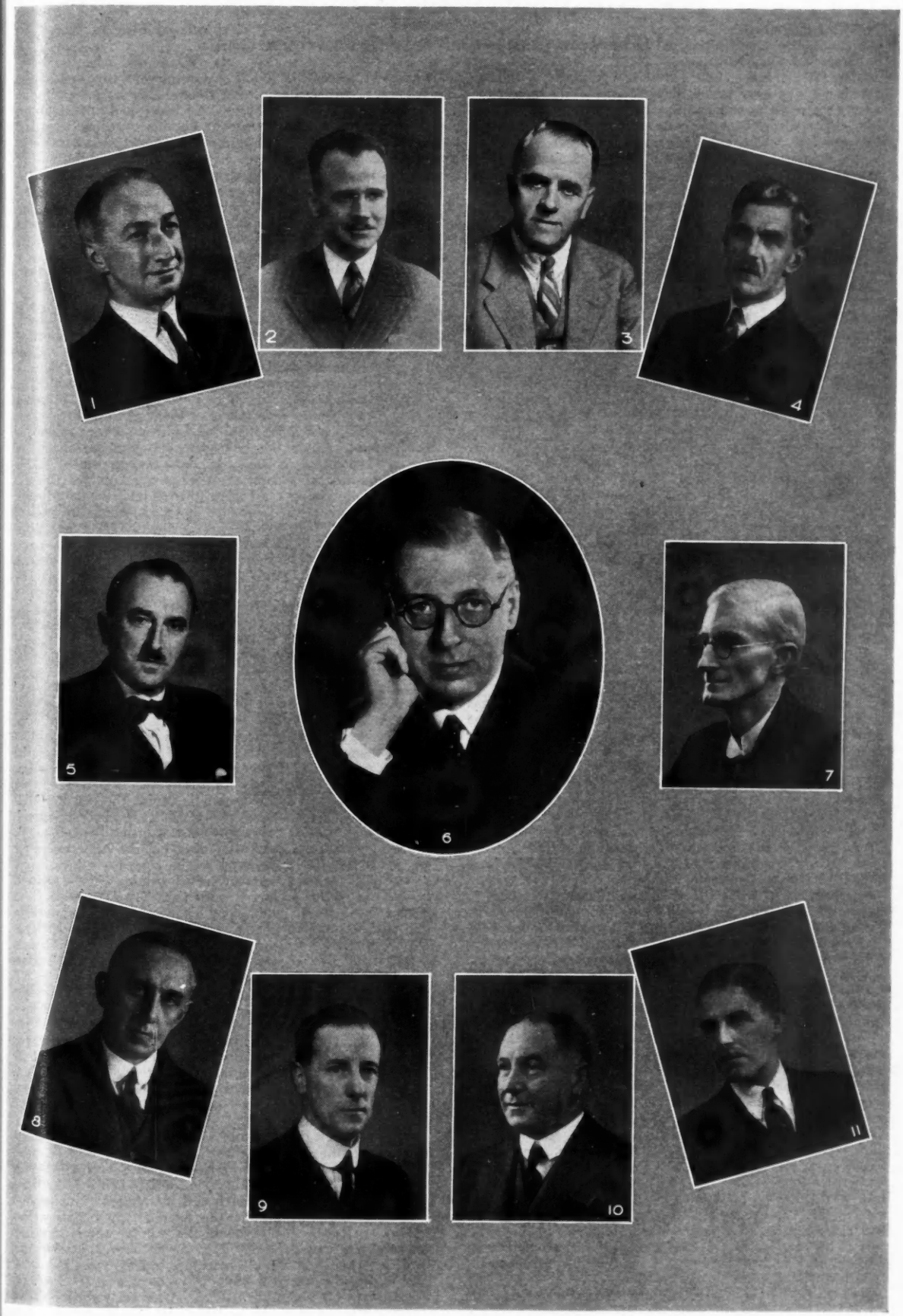
A generating station under construction in Russia for utilising wind energy will comprise two 5,000 kW alternators in a ferro-concrete tower 500 ft. high by 6ft. in external diameter. Each machine will be driven, according to *Electrichestvo*, by a propeller of three 130-ft. blades with speed control between 20 and 600 r.p.m.; a uniform circumferential speed of 280 ft. per second is aimed at. One alternator is being mounted 210 ft. above ground, the other being at the top of the tower. A generation pressure of 6,000 V will be stepped up to 110 kV to feed into the Crimean network. Capital cost is roughly equivalent to £32 per kW, and the overall cost of generation to 0.4d. per kWh. Allowing for operation and maintenance charges, this implies a load factor on 10,000 kW of 30 per cent., which seems a high figure considering that a wind velocity of 45 m.p.h., *i.e.*, a strong gale, is needed to produce the full output, while 36 m.p.h., more than half a gale, yields less than 2,000 kW. There are not many places in the world where the essential conditions are available for successful running of a plant of this kind.

Problems

The I.E.E. South Midlands Students' Section has arranged a "problems evening" for October 28th. Members of the Section are invited to send suggestions for problems of a technical or semi-technical nature which they would like to have discussed as early as possible to the hon. secretary (Mr. D. R. Parsons). An analysis of the replies ought to yield some quite useful information on the subjects which are of most interest to younger engineers or of the chief difficulties they encounter to which attention might well be paid by those in a position to give assistance apart from the present instance. It is to be hoped, therefore, that response will be made by all concerned, whether or no they would wish to take part in a discussion on the subjects of their choice.

The Institution's Leaders

The President of the Institution of Electrical Engineers (Mr. H. T. Young) delivers his inaugural address next Thursday. We present in this issue portraits of the President and chairmen with notes on their careers. Mr. Young is a contractor and there is another representative of that branch of the industry in the person of Mr. E. A. Reynolds, chairman of the South Midland Centre. The supply section is well represented: companies by Messrs. H. C. Babb and R. Siviour; municipal authorities by Messrs. F. E. Spencer and J. W. Spark; and the Central Electricity Board by Mr. D. Maxwell Buist. Mr. G. F. Shotter is a supply man too, but he is a specialist in metering, as our readers know. Railway electrical engineering is Mr. W. Storey's occupation; he is serving a second term as chairman of the Irish Centre. Industrial scientific research is recognised in Dr. P. Dunsheath's election as chairman of the Transmission Section, and science and education are both represented by Dr. E. Mallett. The remaining chairman, Mr. G. L. Porter, is on the manufacturing side of the industry.



The President and Chairmen of the Institution of Electrical Engineers for the 1936-7 Session.
(See next page)

1. Mr. S. R. Siviour (North Midland Centre). 2. Mr. D. Maxwell Buist (North-Eastern Centre). 3. Mr. W. Storey (Irish Centre). 4. Mr. E. A. Reynolds (South Midland Centre). 5. Dr. E. Mallett (Wireless Section). 6. Mr. H. T. Young (President). 7. Mr. G. F. Shotter (Meter and Instrument Section). 8. Mr. F. E. Spencer (Mersey and North Wales (Liverpool) Centre). 9. Mr. G. L. Porter (North-Western Centre). 10. Mr. H. C. Babb (Scottish Centre). 11. Dr. P. Dunsheath (Transmission Section). (*Photos* 1, 4, 8 *and* 11 *by Lafayette;* 3 *and* 5 *by Elliott and Fry;* 6 *by P. Tanqueray*).

The I.E.E. Session Commences

The new Centre and Section chairmen

On Thursday next the London session of the Institution of Electrical Engineers opens, when Mr. H. T. Young will deliver his presidential address. A number of the local centres have already commenced their meetings. On the preceding page we reproduce the portraits of the chairmen of the various Centres and of the Wireless, Meter and Instrument, and Transmission Sections, and below we give a brief biography of each of these gentlemen :—

Mr. H. T. Young is well known as governing director of Messrs. Troughton & Young, Ltd., electrical contractors and engineers, and, in addition to his activities on I.E.E. committees, for his work for the E.C.A. and E.D.A. An account of his career appeared in our issue of June 5th, 1936.

Mr. S. R. Siviour, chairman of the North Midland Centre, received his early training with the Croydon Corporation and Callender's Cable & Construction Co., Ltd. With the latter company he was engaged in construction, testing and maintenance work on many large contracts for mains, sub-station and traction equipments in the North of England and Ireland, including some of the earliest 11-kV cables and overhead lines in 1904. He joined the Yorkshire Electric Power Co. in 1911, and since 1922 has occupied the position of mains construction superintendent. During his service with the company he has been closely identified with the construction of the majority of the transmission and distribution systems of the five associated companies which now consist of over 3,000 miles of mains. Mr. Siviour is a member of the Transmission Section Committee of the Institution and also of the B.S.I. Technical Committee on "Regulations for Overhead Lines."

Mr. E. A. Reynolds (South Midland Centre) is the youngest son of the late Ald. A. J. Reynolds, a former Lord Mayor of Birmingham. He was educated at King Edward's School, Birmingham, and from there gained a scholarship at Pembroke College, Cambridge, for mathematics in 1896. He sat for the Mathematical Tripos in 1899, and passed as a Wrangler. In the following year he took the Engineering Tripos in which he obtained another first class, and later on received his M.A. degree. After leaving Cambridge Mr. Reynolds went to the Rugby Works of Messrs. Willans & Robinson, Ltd., and continued there for five years. In 1905 he returned to Birmingham and commenced as an electrical contractor under the name of Reynolds & Bradwell, in partnership with the late Mr. J. D. Bradwell, and he still continues in this business up to the present day. He has been associated with other businesses, and is a director of Messrs. John Reynolds & Sons, nail manufacturers. For a long time he has been an active member of the Electrical Contractors' Association, and has served on its Council for many years. He is a member of the Institution Wiring Regulations Committee as a representative of the Electrical Contractors' Association. He has always taken a great interest in the technical training of trade apprentices, and is the chairman of the City and Guilds Advisory Committee for the Contracting Industry.

Mr. D. Maxwell Buist (North-Eastern Centre) was born in Cupar, Fifeshire, and received his technical education at Fife Mining and Engineering College and Heriot-Watt College and, after obtaining first-class honours in the final City and Guilds of London Institute examinations in electrical engineering and electrical installation work, interrupted his apprenticeship in the Electrical Engineering Department of the Lochgelly Iron and Coal Co., Ltd., to enter Edinburgh University. Later, on the outbreak of war, he joined the Royal Air Force after serving two years as assistant distribution engineer with the Fife Electric Power Co. On leaving the R.A.F. he was appointed technical assistant to the city electrical engineer of Edinburgh, which post he held for nearly four years before being appointed personal assistant to Major H. Bell, then city electrical engineer of Hull. He left Hull five years later to become chief electrical engineer of Imperial Chemical Industries, Ltd., at Billingham-on-Tees, and during his two and a half years there was responsible for the erection of the 80,000-kW power station, for the description of which he was awarded, as joint author, the Paris Premium of the Institution in 1930. He took up his present post as district manager of the Central Electricity Board, N.E. England Area, in 1930. In the earlier part of his career Mr. Buist lectured on electrical engineering subjects at Fife Engineering College, Viewforth School and Heriot-Watt College.

Mr. G. L. Porter (North-Western Centre) succeeded Mr. C. W. Bridgen as manager of the Midland Area for Messrs. Ferranti, Ltd., in July, 1934, and for seven years previous to that appointment was advisory engineer to the company.

Mr. F. E. Spencer (Mersey and North Wales (Liverpool) Centre), was educated at a private school in Derby, and received his training at University College, Nottingham. He was chief assistant electrical engineer to the Birkenhead Corporation, before being appointed to his present position of borough electrical engineer to that Corporation.

Mr. W. Storey, who has been re-elected chairman of the Irish Centre, was educated at St. Andrews' College, Dublin, and received his early training as pupil to Messrs. Egan & Tatlow, electrical engineers, Dublin. After completing his pupilage he became principal technical assistant in that firm and carried out important contracts in Dublin and in various parts of Ireland. He joined the staff of the G.S. & W. Railways, Ireland, in 1911, as electrical engineer, and was appointed electrical engineer to the amalgamated and absorbed Irish railway companies known as the Great Southern Railways Co., in 1925. Mr. Storey is responsible for all electrical work in the chief mechanical engineer's department of the railways, including electrical machinery and workshop equipment, train lighting and electric traction.

Mr. H. C. Babb (Scottish Centre) was educated, served his apprenticeship, and received his early training at Bristol. In 1896 he joined the Sheffield Electric Light & Power Co., Ltd., and later was with Messrs. Steel, Peech & Tozer, of Rotherham. He went to Guernsey in 1901 with Edmundson's Electricity Corporation, and afterwards was at Dartmouth and Hawick with the same company. He joined the National Electric Construction Co., Ltd., at Bo'ness (Scotland) in 1915, and three years later the undertaking of the Musselburgh and District Electric Light & Traction Co., Ltd., was placed under his management. When the Bo'ness undertaking was acquired by the Corporation in 1922, Mr. Babb was appointed to his present position of general manager of the Lothians Electric Power Co., retaining the general managership of the Musselburgh Company. The Lothians Company serves an area of approximately 700 square miles. During the War Mr. Babb acted as Assistant Coal Controller for Scotland.

Mr. J. W. Spark, the chairman of the Western Centre, is city electrical engineer of Bath. He opened the 1936-37 session of the Centre on Monday last when he delivered his address at the Municipal Technical College, Bath.

Dr. P. Dunsheath, chairman of the Transmission Section, is chief engineer of Messrs. W. T. Henley's Telegraph Works Co., Ltd. He received his early training at the University of Sheffield, and with Messrs. Davy Bros., engineers, of that city. Subsequently he took a first-class honours B.Sc. degree at London University and in the Mechanical Sciences Tripos at Cambridge. Later he received the degree of D.Sc. in engineering at London University. In competition for candidates for the G.P.O. Dr. Dunsheath entered the Engineer-in-Chief's Office, and remained until the War, when he held commissioned rank in the Royal Engineers, being twice mentioned in dispatches and awarded the O.B.E. (Military). In 1919 he joined the staff of W. T. Henley's Telegraph Works Co., Ltd., for the purpose of organising the company's research laboratories, and after directing the laboratories for ten years, he was transferred to the company's head office as technical manager, subsequently becoming chief engineer. In addition to his electrical activities, Dr. Dunsheath is a mechanical engineer, and among his many inventions, perhaps the most outstanding is the continuous lead extrusion machine. Dr. Dunsheath is a member of many industrial committees.

Mr. G. F. Shotter, the chairman of the Meter and Instrument Section, received his electrical training at the South Western Polytechnic and joined the Corporation of London Electricity Department in 1903. In 1906 he went to the Willesden power station of the North Metropolitan Electric Power Supply Co., and later he was transferred to Friern Barnet, where he is now in charge of the Northmet Company's Meter Department. Mr. Shotter was president of the M.E.T.A. (Meter Engineers' Technical Association) before it was absorbed by the I.E.E., and he has served on several B.S.I. and E.R.A. Committees.

Dr. E. Mallett, chairman of the Wireless Section, was educated at Southend High School and University College, London, and was awarded the David Hughes Scholarship of the I.E.E., and the Ellen Watson Memorial Prize in applied mathematics. He was apprenticed to Messrs. Crompton & Co., at Chelmsford, and went as an assistant engineer (Post Office) to Glasgow. Just before the war he was engaged on transmission work. During the war he served in the 52nd and 74th Divisional Signal Companies in Egypt and Palestine, and during the last year of the War he was in the Research Department of Woolwich Arsenal. After the war Dr. Mallett returned to the Post Office, where he became interested in the application of the thermionic valve to telephony; later he was engaged in designing and selling paper-making machinery. Following this he began teaching and for twelve years was assistant professor at the City and Guilds (Engineering) College. For the past four years he has been principal of the Woolwich Polytechnic and head of the Electrical Engineering Department.

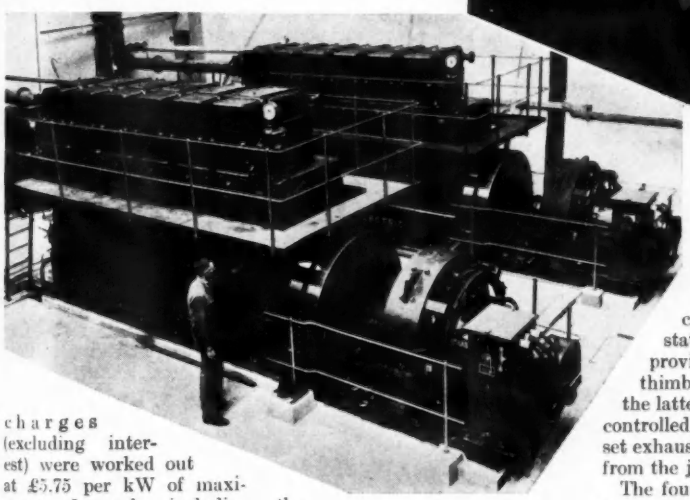
The Pinewood Film Studios

Electric immersion heaters for load levelling and distribution for stage illumination from overhead gangways

THE new Pinewood film production studios at Iver Heath, Bucks, occupy a site of some fifty acres of thickly timbered land, meadows and lawns, 200 ft. above sea level midway between Uxbridge and Slough. At the time of our visit there were in being four stages in three steel and concrete buildings, two covering 18,150 sq. ft. each and the others about half that area; a further studio of the larger size is in course of construction. The complete scheme allows for eight studios arranged in pairs of stages, one large and one small for each producing company, with a common building between housing the ventilation plants, sound, camera and monitor rooms as well as dressing rooms and offices.

The annual consumption of electricity is expected to reach at least 1,500,000 kWh, a third of which will be used for illuminating the stages for film photography. The maximum demand is estimated at 1,740 kW.

Consideration was given to taking a supply from public mains, but with the low load factor and intermittent demand of a film studio, the two-part tariff offered compared unfavourably with the costs obtainable with Diesel plant which was consequently installed. For the latter the fixed charges (excluding interest) were worked out at £5.75 per kW of maximum demand, including the wiping off of the capital outlay on plant and buildings in ten years, wages, repairs and maintenance (one per cent. of the cost of the whole plant), stores and administration. Running charges (fuel oil and lubrication) were taken at 0.35d. per kWh, based on a fuel consumption of a little over 0.6 lb., allowing for the beneficial effect of load levelling by means of electric immersion heaters.



Above: "Shooting" a scene in "London Melody" Left: Two 500-kW Diesel sets

Subsequent tests at the manufacturers' works on the Diesels, which it was decided to install, gave an average fuel consumption throughout the range from half to full load of 0.543 lb. per kWh, or, say, 0.286d., which with allowance for lubricating oil makes the running cost just over 0.3d. per kWh. A 200-kW auxiliary set has been running with a fuel consumption well within the guaranteed figure of 0.59 lb. at half load.

The capacity of the plant needed depends largely upon the directors' and camera-men's needs and preferences, but data derived from five other studios showed an average plant capacity (at its overload rating) of 1 kW per 30 sq. ft. of stage area, apart from the non-stage demand. Little information is available as to the diversity of demand between several large stages or between them and other loads. In one large London studio with several stages the duration of the peaks is from nine to twelve minutes and peak loads account for up to one-quarter of the total working time. The output of the sets required for supplying a total stage area of 72,490 sq. ft. was therefore taken at the two-hour overload rating of 2,430 kW.

In addition to the studio load, about 250 kW is installed for general lighting, 50 kW for occasional heating, 25 kW for cooking, and there is 275 kW for motors. The twelve-hour rating of the five Diesel-driven 240 V d.c. three-wire shunt-wound generators is 2,360 kW. Three of the sets have capacities of 500 kW (six-cylinder) and one (under construction) of 660 kW (eight-cylinder) all at 375 r.p.m. A 200-kW (six-cylinder) 600-r.p.m. "house" set carries the load during nights and week-ends. These engines can be run up from cold and put on full load in 1¼ min. An oil-immersed static balancer (257 A out-of-balance current) and a Brown-Boveri automatic voltage regulator with load-sharing device are installed for each generator.

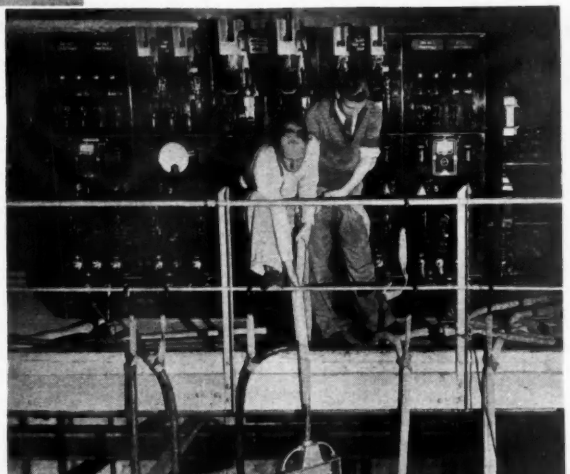
Jacket cooling water is pumped through the general heating system. Temperatures of from 130 to 140 deg. F. at the inlet to the engine cylinders and from 150 to 155 deg. at the outlet are maintained by means of thermostats and automatic three-way valves. Jacket water passes constantly through the body of a heat exchanger, but only when the cylinder outlet temperature exceeds 150 deg. is cooling water circulated in the tubes by the operation of a thermostatically controlled valve. Each of the main engines is provided with a Burgess air-inlet silencer and a Clarkson thimble-tube boiler heated by exhaust gas; the water from the latter is also pumped into the general heating system and controlled in the same manner as the jacket water. The house set exhausts directly into the main flue and only the waste heat from the jacket water is utilised.

The foundations for the sets now installed consist of a 2 ft. thick concrete raft, a 2½-in. layer of "Coresil" cork, and a 7-ft. deep concrete block, between which and the surrounding earth is a 6-in. space. The total weight is 875 tons or 5.5 times that of the engine and generator. Generator-voltage ripple between outers and neutral has been reduced to a very low value largely due to a graded air gap which increases in length from the entering edge of the generator pole face to the leaving edge and to the skewing of the armature slots. The English Electric Co., Ltd., was the principal contractor for the power-house equipment.

Aluminium feeders to studios

The hot-water system for warming the studios and other buildings, carried out by Messrs. Rosser & Russell, Ltd., is fed from a 5,000-gal. storage vessel supplied from five sources: (1) the engine jacket-water; (2) the exhaust-gas boilers; (3) electric immersion heaters in accordance with a method initiated by the consulting engineer, Mr. Pakenham Beatty; (4) an incinerator boiler for burning waste wood and rubbish; and (5) two loco-boilers with Bastian & Allen automatic stokers capable of producing nine million B.th.u. per hour. It was computed that 23,380 million B.th.u. per annum would be required at an average hourly rate of 6.53 million in thirty-two weeks in winter and 1.25 million for the rest of the year. In winter 51.3 per cent. and in summer all of the heat can be provided by the engines.

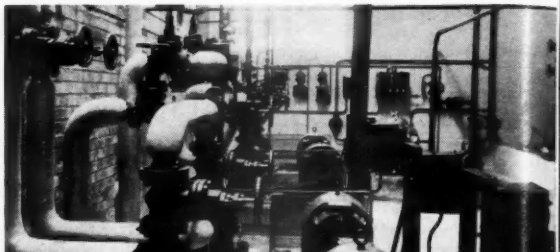
The mean immersion-heater load in winter is expected to be 278 kW and in summer 40 kW; the annual consumption is estimated at 950,000 kWh. Under these conditions the overall thermal efficiencies of the engines would average over 65 per cent. per annum, in spite of fluctuations in the studio load between 150 and 1,500 kW. The true cost of the total heat supplied by the engines may be taken as the difference between the fuel cost for the combined studios and the immersion-heater load and that for the studio load only. For total loads of from 300 to 500 kW per generator (including 150 kW of heaters) the cost per million B.th.u. is about 18.5d. Owing to the large amount of heat available in the cooling water and exhaust gases, due to the studio load, the average number of B.th.u. per kWh of electric heating is 12,030 in winter and 31,250 in summer, or 13,600 for the year, which is equivalent to 73.5 kWh per million B.th.u. Heat raised in the coal-fired boilers also costs 18.5d. per million B.th.u.



The three banks of 150-kW B.T.H. immersion heaters (one for each 500-kW set) are switched on automatically by contactors controlled by current relays and thermostats in steps of 50 kW when the studio load on any set is reduced to 200 kW, and switched off at 300 kW. By means of hand control the whole 450 kW of immersion-heater load can be thrown on to one generator.

The eight-panel main switchboard by the Power Equipment Co., Ltd., controls the five generators, the auxiliary-services switchboard (by the same makers), the immersion-heater circuits and the earth-leakage devices. On the gallery above is a Whipp & Bourne studio-feeder switchboard consisting of two 5,000-A and four 3,000-A d.p. panels with instantaneous trips on both poles and common shunt trips operated from the studios and with main switch contacts that can be swivelled outwards for cleaning. Instruments record the actual volts in the studios.

Bare aluminium bars in multiple up to 6 in. by ⅝ in. each, insulated by means of "Sindanyo" racks and supported by the steel work of the covered corridors, were selected for the main feeders on the grounds of economy and the structural strength needed for unsupported spans up to 20 ft. A capacity of 10,000 A (at 650 A per sq. in.) at 115 V has been allowed for two of the large studios, 15,000 A for the third as a provision for colour photography, and 6,000 A for each of the small



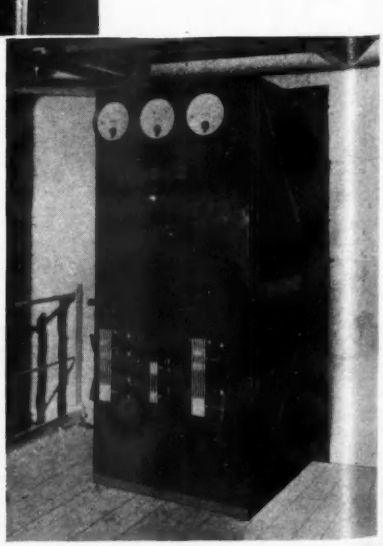
Pumps for circulating the cooling water after use, for heating purposes

stages. This gives a voltage drop between outer and neutral of 4 V, rising to 5 V for the most remote stage.

Joints are made by overlapping the bars for a distance of ten times the thickness of the bar and jointing and clamping them together with cast-iron plates; the resistance of the joints is said to be no more than that of an equivalent length of bar. Expansion joints of flexible foliated copper are fixed in straight runs exceeding 100 ft. The bare aluminium ring mains inside the studios are enclosed throughout in continuous sheet-steel trunking and are installed in a 4-ft. space between the running joists and the gangways. The bars were supplied by the British Aluminium Co., and installed by Messrs. Marryat & Place.

From 9 to 11 ft. headroom is available above the gangway for the studio switchboards, supplied by the Power Equipment Co., Park Royal Engineering Co., and the Westwood Manufacturing Co., controlling different sections of the floor beneath; six are installed in the larger and three in the smaller studios. Each switchboard consists of five front panels and two side panels. Two of the front panels are equipped with d.p. back-of-panel knife switches and enclosed 400-A and 60-A fuses; the side panels, which are similar, are controlled from two other front panels having 1,000-A d.p. circuit-breakers, two ammeters, a 400-A knife switch and fuses; the fifth panel controlling the supply to the whole board has a 2,000-A circuit-breaker, a kWh meter, a 400-A d.p. knife switch and fuses.

Left: A portable control desk or "organ" on floor of stage. Centre: Lowering a "spider" from the gangway to connect lighting housings with the studio distribution board. Below: Studio isolator panel



Shunt trips on the d.p. circuit-breakers on the studio switchboards are controlled from a desk on a floor, from which

rising and falling main double doors, silence signs and ventilating motors are also operated.

Flexible trailing cables, clamped to any of the sixty 400-A terminals on the studio switchboards, are plugged into "spider" boxes containing high-rupturing capacity fuses, whence connecting cables are led to the lamps on spot rails or platforms suspended above the sets. Feeder cables of up to 1.00 sq. in. copper have been laid from the power house to three 7,000-A pillars in the paddock and to three 4,000-A and two 3,000-A pillars in the gardens. Cable and pillars are of the B.I. Co.'s standard construction.

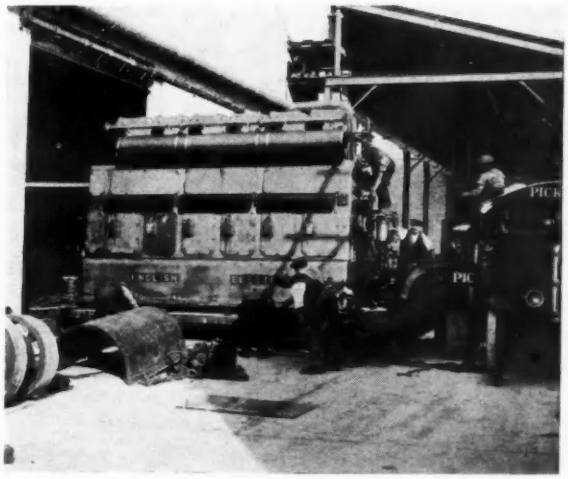
Of the various associated workshops, the carpenters' seemed to us to contain most of electrical interest. About half of its 15,250 sq. ft. is occupied by wood-working machines; among these is a high-speed router of versatile characteristics. Every machine is self-contained with its own B.T.H. electric drive, current for high-speed tools being obtained from d.c. to a.c. 150-cycle motor generators.

For sound recording, Western Electric equipment has been installed. This consists of two wide-range a.c. operated permanent film-recording channels and five d.c. operated channels for portable work, two of which can be adapted to a.c. working in the studios. Any channel may be used on any stage, and either permanent channel may be connected to the one of the two scoring and dubbing stages. Two wax-recording machines for re-scoring and playback purposes are to be installed at the central recording point, and headphone and loud speaker monitoring equipment will be available on all stages. All-mains wide-range installations are provided in two review rooms. A link between the d.c. and a.c. systems is provided by a Crompton-Parkinson motor generator. The whole of the wiring of the 8½ acres of buildings, including the installation of overhead and underground armoured cables, has been carried out under the supervision of Mr. Hall, of Messrs. Hall and Stinson, Ltd., who were responsible for the electric lighting and heating.

Laying a cable to a distribution pillar in the grounds

For studio lighting Messrs. Mole Richardson (England), Ltd., have supplied 175 2-kW and 5-kW "Solar" spot lamps and fifteen 120-A high-intensity arcs designed for colour photography fitted with silent motor drive and "Marine" stepped lenses as used with the "Solar" spots. It is claimed that with these lenses projection with even field can be obtained at all angles of beam from a sharp spot to 44 deg.

Nearly 300 spots and rifle floods, from 0.5 to 2 kW, have been provided by Messrs. R. R. Beard, Ltd., together with forty 300 mm. 40-A arcs, twelve 120-A arcs and thirty-two 80- and 150-A sun arcs. Lamp housings are provided in many cases with doors at the back and front of the stirrup and the control of the arcs is facilitated by feeding and focusing handles at each end of the housing. Variable-focus condensers permit the



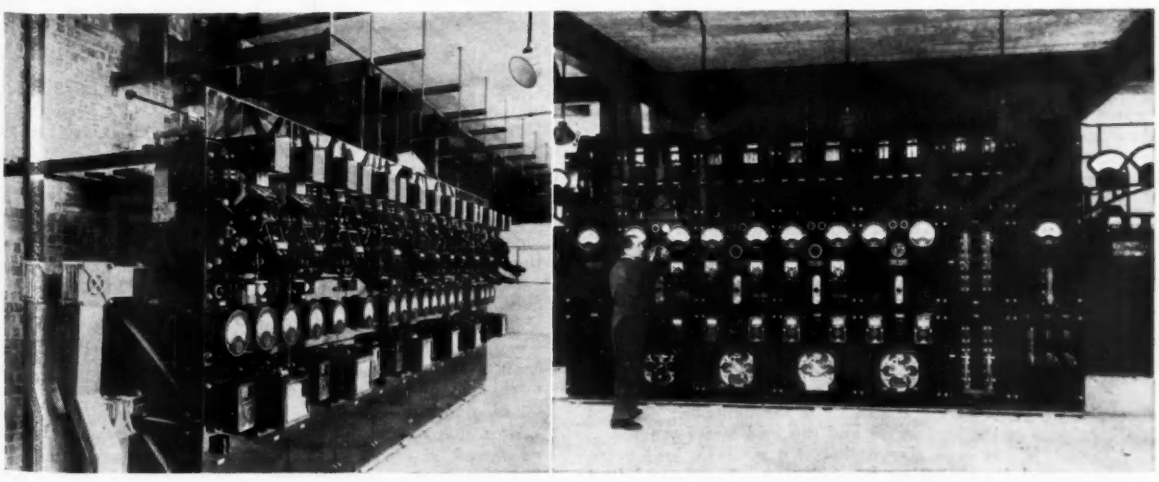
The third Diesel set arriving in one unit from the works

1-kW spots to be changed from flooding to spotting with minimum loss of efficiency, although irises and masks are fitted. Kandem Electrical, Ltd., have supplied six 300-A sun arcs (for producing sunlight effects or for use when the projectors have to be mounted at a considerable distance from the set). Each facet of the 1,000-mm. parabolic reflectors is secured resiliently and can be rapidly removed.

The General Electric Co., Ltd., was responsible for thirty-five 5-kW projectors on telescopic stands, seventy-two 2-kW reflector spotlights, a hundred single-light broadsides and forty-eight overhead reflector units, each containing six 1,500-W "Osram" lamps. The last-named company also supplied 300-W lanterns for thoroughfare lighting and fittings for office lighting.

Good photographic lighting is the main concern in the studios; ease of handling, solidity of construction, low first cost and economy in consumption are, we were informed by the electrical consultant, of subordinate importance. In order to create the appearance of depth and to give emphasis to details, "modelling" units are required to supplement the "general" lighting which controls the shadow density over an entire set. The illuminating intensity of general lighting may range from 200 to 500 ft.-candles, whereas more than 1,500 ft.-candles over considerable surfaces at greatly varying distances may be required of modelling units.

The planning of the Pinewood Studios was due to Mr. Chas. Boot, chairman of Messrs. Henry Boot & Sons, who carried out the construction with the collaboration of various specialists, Mr. Pakenham Beatty being the consultant for the electrical plant and equipment. To him and to Messrs. F. Hauser (chief electrical engineer) and T. Knight (chief maintenance engineer) our thanks are due for data supplied and facilities provided for visiting the studios.



Left: The main studio switchboard mounted in a gallery above the generator board (right)

Distribution Losses.

By G. W. Preston, A.M.I.E.E.

MUCH has been written lately on load and diversity factors and their effect on supply costs. These matters in relation to distribution losses were also discussed by Mr. D. P. Sayers in the ELECTRICAL REVIEW of September 4th. The effects of load conditions on generation and distribution efficiencies differ fundamentally in many respects. Unlike generation efficiency, the efficiency of a distribution line or cable is a maximum at minimum load and decreases as the load increases.

Generating costs depend to a large extent on average system conditions, whereas distribution costs are more dependent on local conditions and may have little or no relation to average conditions. For instance, the losses in a distribution line depend only on the characteristics of the loads which it supplies and obviously have no relation to conditions existing in other parts of the system.

Accurate analysis of system losses is a difficult problem the complexity of which increases rapidly with the degree of accuracy required. Since resistance losses vary as the square of the current, they cannot be determined from a knowledge of the load factor and the magnitude of the load unless the shape of the load curve is also known. The loss in a conductor of resistance R due to the flow of a current having a maximum value I_{max} and an r.m.s. value $I_{r.m.s.}$ during a period of T hours is $I^2_{r.m.s.} \times R \times T = I^2_{max} \times R \times T \times \frac{I^2_{r.m.s.}}{I^2_{max}} \quad \frac{I^2_{r.m.s.}}{I^2_{max}}$ is a factor whereby the effective loss over a period can be expressed in terms of the loss at maximum current, or "loss factor.

The loss factor or load factor of the losses is not the same as the load factor of a load, but varies with the shape of the load curve of which the form factor is a measure. The form

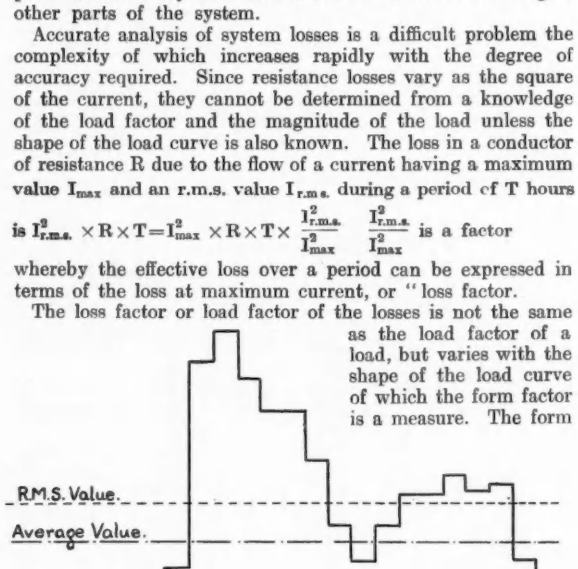


Fig. 1

factor of a curve is the ratio of the r.m.s. value of the curve to the average value, while the loss factor is the ratio of the mean square value of the load to the square of the maximum value. That is to say, the loss factor is equal to the square of the product of the load factor and the form factor.

Although the load factor of two loads may be the same, their loss factors will not be the same unless the form factors of the two load curves are identical. The shape of the curves need not be the same, however, as curves of entirely different shape may have the same form factor.

For any load factor other than unity the loss factor has a minimum value when the form factor approaches unity. If the form factor were unity the loss factor would be equal to the square of the load factor, and this minimum value would be approximately attained in the case of a load curve having a steady value throughout the period taken, with one peak of very short duration just sufficient to establish a maximum demand.

Similarly, the loss factor has a maximum value equal to the load factor when the form factor has a value of $\sqrt{\frac{1}{\text{Load factor}}}$, such as would be the case with a curve having a steady maximum value for a portion of the period taken and zero value for the remaining portion.

The form factor of load curves therefore lies between these two limiting values of unity and $\sqrt{\frac{1}{\text{Load factor}}}$ In many cases it is found that the loss factor is approximately equal to half the sum of the load factor and the load factor squared.

Although it has been shown that if a symbolic load curve is constructed by replotting the ordinates of an actual load curve in order of magnitude, an equation to the curve can sometimes be determined from which the loss factor can be obtained mathematically by integration. Load curves cannot be completely expressed in mathematical form.

Load factor and form factor

The determination of the mean square value of a complicated load curve usually involves a certain amount of laborious calculation, but the r.m.s. value and loss factor for any load curve can be determined very readily by making use of polar co-ordinates.

When half a sine curve is plotted to polar co-ordinates the resulting curve is a circle. The diameter of the circle is equal to the maximum value of the sine curve, and, since

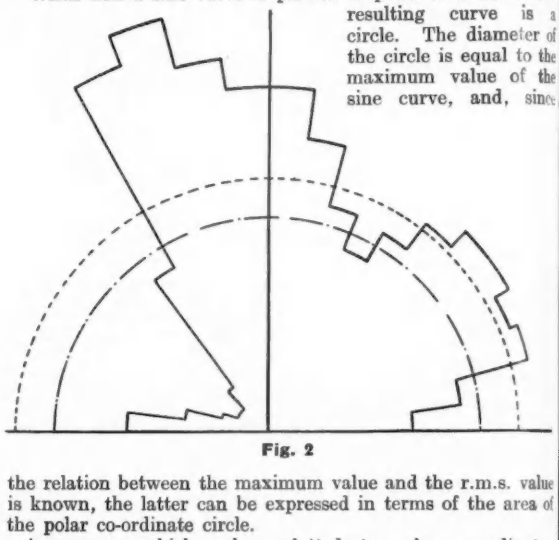


Fig. 2

the relation between the maximum value and the r.m.s. value is known, the latter can be expressed in terms of the area of the polar co-ordinate circle.

Any curve which, when plotted to polar co-ordinates, encloses the same area as that enclosed by the sine-wave circle will have the same r.m.s. value as the sine wave. Thus, to obtain the loss factor for any load curve, it is only necessary to plot the curve to polar co-ordinates and measure the area enclosed, which can be done very simply with a planimeter. The loss factor can then be obtained directly as follows: Loss factor $= \frac{2}{\pi} \cdot \frac{A}{I^2_{max}}$; r.m.s. value $= \sqrt{\frac{2.A}{\pi}}$; where A is the area enclosed by the polar co-ordinate curve and I_{max} is the maximum value of the load current. As an example, the load curve in fig. 1 is plotted to polar co-ordinates in fig. 2.

A knowledge of the loss factor for the loads supplied is necessary before distribution losses can be determined. Typical daily load curves can be obtained for various classes of consumer, and average load curves for the whole or any part of a system can be built up by the superimposition and summation of typical curves.

When the characteristic shape of typical daily curves for any particular type of load does not vary appreciably from month to month it is necessary only to determine the average and maximum demands for each month and apply the same form factor throughout.

If the maximum demand as shown on the typical daily load curve each month is expressed as a fraction of the monthly maximum demand, and the latter as a fraction of the annual maximum demand, the average daily loss can be expressed in terms of the annual maximum demand as follows: : Daily loss in terms of annual m.d. $= I^2R \times 24 \times LF \times D^2 \times M^2$, where I = annual maximum demand current, LF = loss factor for typical daily load, D = ratio of daily to monthly m.d., M = ratio of monthly to annual m.d.

Owing to a number of unknown factors an analysis of distribution losses can never be very accurate. For instance, it is extremely difficult to estimate the losses in neutral conductors, since the current in those conductors varies considerably and cannot be accurately determined. Perfectly balanced phase loads at the end of a distributor are no indication of the load balance and current in the neutral at other points.

Even partly accurate analyses of losses, however, often produce results which lead to worth-while improvements in distribution efficiency, for the cost of kWh lost is in many cases greater than that of kWh usefully employed. Resistance losses, for instance, are a maximum at maximum load and add directly to the peak. Losses have also to be transmitted, and themselves give rise to losses.

How many distribution systems would not be drastically reinforced or even reconstructed if only it were possible to visualise clearly the steady drain on their efficiency at points for the most part out of sight and out of mind?

Mining Electrical Equipment

Special influences in design and manufacture

To the non-mining electrical mind the first impression of the manufacture of motors for driving mining equipment (such as coalcutters and shaker conveyors), as we saw it recently at the Glasgow works of Messrs. Mavor & Coulson, Ltd., is of unorthodoxy. Established ideas from other fields are brushed aside because here considerations of safety predominate over all questions of design. The influence of flameproof requirements is everywhere apparent in the construction.

It is true that in the fabrication of the rotor, in the notching of the rotor laminations and in the winding and brazing of the ends of the bars to the short-circuiting rings there are suggestions of mass production, but in the catering for special shapes and sizes, such hints of mass production seem to disappear. It will be appreciated that where the stator frame actually forms part of the machine itself, as in the case of a coalcutter, the design of the stator structure cannot follow normal lines. Apart from considerations of safe flameproof construction, the mechanical features in view of the particularly strenuous conditions under which the equipment has to work are all-important.

On the electrical side in the restricted-height machines the designer must make the best use of the space available. In the case of coalcutters, just what is "best" is difficult to say, there being no complete agreement as to the rating and characteristics of a motor. Apart from considerations of safety, perhaps the first result of modern development at the coal face is the call for increased power. Not only is a high cutting rate required to-day, but with the increased mechanisation of the mines there is a tendency to lengthen the coal faces.

One result of this call for increased power is the tendency to separate the switchgear from the motor at the coal face and to have it back at the gate-end, but here, again, this question is linked up with that of safety, as the advantages of having the switchgear away from the coal face are obvious, while the importance of control and protection of the trailing cable and plug is nowadays widely recognised. Mr. Mackay, the electrical designer, said that in certain cases with lower voltage the limiting factor in power available was the switchgear and that the motor could not be treated separately in design; rather must the whole of the electrical equipment at the face, including the switchgear, be treated as a unit. All switchgear for the company's products is manufactured by M. & C. Switchgear, Ltd., and the co-operation between this associate and the parent company, in view of the unusual influences of the motor on switchgear design, must be particularly close.

It was noted that the double squirrel-cage rotor construction applies generally to the M. & C. motors for all conveyor work, as does the slewing of the slots or bars across the rotor facial periphery. For coalcutters, it appeared that for normal coal mining conditions the deep bar rotor was favoured by the company and the double squirrel-cage rotor used only in motors intended for special cases, usually in the mining of materials other than coal.

In other fields processes pertaining to the insulation of windings have become so generally standardised that one notices here how the consideration of flameproofness alters procedure to the extent that in certain stators the insulation of the windings of these special motors is not impregnated after assembly; instead, pre-treated windings are used. This variation from industrial practice is necessary on account of the impossibility of ensuring complete draining of the flameproof structure with its heavy internal ribbing.

As to factory equipment, we should say that the installation for testing flameproof enclosures is the most interesting. It consists of a boiler shell about 4 ft. 6 in. in diameter partly embedded in concrete. A steel-plate door at the front can be bolted in position with suitable packing to make a gas-tight joint after the apparatus under test is in place. To arrange for relief of pressure within the chamber when the outer gas is deliberately fired, two light steel doors are suitably positioned on the top of the boiler and arranged to open at a pressure of less than 2 lb. per square inch. At certain positions in the length of the chamber, and at its "open" end, wooden frames are fitted to which paper can be pasted to complete an enclosure of suitable length. The paper most satisfactory for this purpose is old newsprint, which blows to pieces before any appreciable rise in pressure can occur. The floor inside the chamber is at the same level as that of the test bed so that the prepared apparatus can be mounted on a simple bogie and run straight into position. The enclosure to be tested has screwed into it a three-way connection which provides independent passages for the gas supply, the high

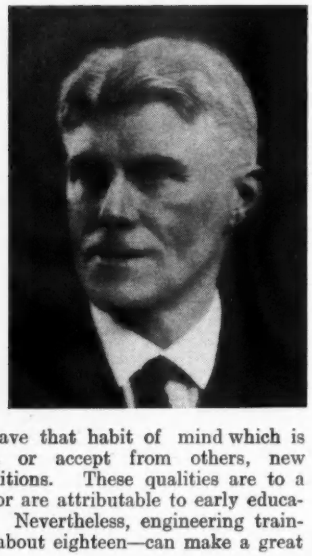
Top: Coalcutter assembling gallery at the M. & C. works. Bottom left: Arcwall coalcutter under test on 1 in 5 gradient. Bottom right: Samson coalcutter cutting 13 in. above floor level on a longwall face

Engineering Education. By C. L. Fortescue

Does the present system of electrical training produce the best possible results?

ALTHOUGH the engineering industry has expanded enormously in the past thirty years and has become the basis of all productive industry, the training offered to young men entering the higher grades of the engineering profession has remained almost unchanged. It consists of a theoretical training and a practical training which it is customary to regard as entirely distinct and as serving different objects. Enormous sums of money are spent annually in providing facilities for the theoretical training, and the industry itself provides extensive opportunities for the accepted scheme of practical training. It is natural to inquire whether this long training is desirable and whether the methods adopted are efficient, and, if the answer to this inquiry is not an unqualified approval, what changes are required?

An aspirant for the higher grade appointments in industry must possess the personal qualities of quick perception, good address, tact, and that purposeful honesty which commands trust and willing co-operation from his colleagues. In addition, he must be familiar with the practice of the industry in which he is engaged, and he must be able to refer problems with which he is confronted to the underlying basic principles; and, most important of all, he must have that habit of mind which is always ready to provide, or accept from others, new methods to meet new conditions. These qualities are to a large extent either natural or are attributable to early education and early associations. Nevertheless, engineering training—starting at the age of about eighteen—can make a great contribution. It has three functions to fulfil, *viz.*: (a) The development of the intellectual qualities, (b) The provision of a knowledge of applied science, which is of immediate value in engineering practice, (c) The acquisition of the relevant facts of the branch of the industry for which the young engineer is destined.



Professor C. L. Fortescue, O.B.E., M.A., M.Inst.C.E., M.I.E.E., is Professor of Electrical Engineering in the Imperial College of Science and Technology (City and Guilds), and is, therefore, well qualified to discuss the subject of engineering education

The second and third of these functions are mainly utilitarian (though not wholly) but the processes involved in the first may conceivably have no utility value whatever. It is usually assumed that a university training should stress the first and second functions, leaving the third to subsequent practical experience. Part-time technical college work taken concurrently with a long period spent in practical work stresses the second and third functions. "Sandwich" systems similarly tend to stress the second and third functions. But under modern conditions engineer-apprentices are very frequently allowed the equivalent of one full day a week for theoretical studies—in addition to evening work—and it is by no means correct to say that intellectual development is wholly neglected in either the concurrent or sandwich systems at present in force.

Development of the Intellect

Great differences of opinion are still expressed as to the relative importance of the three functions of the training. Many still maintain that training of a "practical" nature (*i.e.*, the acquisition of great store of the facts of particular processes) is the most important. This is no doubt the case where immediate productive value is concerned. Also, the acquisition of the facts is accompanied in a few individuals by the development of a certain ability for making subconscious judgment of new problems which proves as reliable as the judgment formed by more highly trained intellects. Such men are very valuable to the engineering industry and many engineers holding posts of high responsibility have been trained in this way. It may be argued, however, that had these successful men had the advantage of fuller development of their intellectual powers at the earlier stages of their careers, their success would have been even greater!

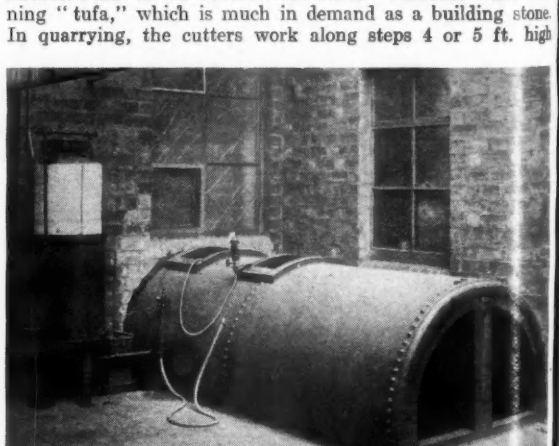
The tendency for engineering to become a more exact science is compelling many of the advocates of a preponderatingly practical training to change their views and it is now generally accepted that given equality of ability and early education, the university trained man who has received greater opportunities for intellectual development will be likely to play a larger part in the industry than that of a man devoting his

Mining Electrical Equipment (*Concluded from previous page*)

voltage lead to a sparking plug mounted inside the enclosure for firing the gas, and a connection to an instrument mounted outside the chamber for indicating the pressure due to the explosion. The gas used for testing is coal gas from the town mains, and the amount fed into the enclosure under routine test is determined by extensive preliminary trials on each particular class of apparatus. When the enclosure has its correct mixture and quantity of gas, the door of the test chamber is closed and gas is admitted. Provision is made for keeping this mixture uniform by means of a fan, and a sampling tube is provided outside the chamber where the gas can be tested. When the outer chamber is filled with a mixture that can be readily ignited, the gas in the inner chamber is fired and the pressure resulting is recorded. As a general rule, to prove that the flameproof enclosure was surrounded by an explosive mixture, the outer gas is subsequently ignited. When the apparatus under test is a conveyor or coalcutter motor, it is connected to a suitable supply and run so as to produce the normal turbulent conditions in the enclosure. On completion of a test, compressed air is admitted to both the enclosure and the chamber to remove all traces of the products of combustion.

No doubt the most interesting recent M. & C. coalcutter is one mounted on a crawler chassis. The "gearhead," which carries the cutting member (the "jib") can be turned to any angle, by which means the arc swept out by the jib as it cuts its way through the solid coal can be made horizontal, vertical or oblique. The body of the coalcutter is carried on four jack screws so that it can be raised or lowered. By using the jack screws and, if necessary, turning the gearhead through 180 deg., the height of the horizontal cut can be made anything from floor level up to 6 ft. 7 in. above the floor level. The motor rating of the particular one we saw in the shops is 70 h.p. for one hour, although for cutting materials other than coal up to 100 h.p. is provided.

Most of the coal mined in this country is worked on the longwall system, for which arcwall coalcutters are unsuitable, and for this work the longwall "Samson" maintains its high prestige. "Samsons" are also used in the Dominions and in foreign countries, not only for cutting coal. We were informed that in the Southern Caucasus "Samsons" are winning "tufa," which is much in demand as a building stone. In quarrying, the cutters work along steps 4 or 5 ft. high and undercut to about 4 ft. deep. Some of the machines have been converted to cut vertically downwards so as to part off the rock at the back of the undercut. The rock is broken into suitable blocks by wedges and taken to factories where it is sawn into the required sizes.



Boiler shell installation for testing flameproof enclosures

training period to practical experience with only part-time theoretical work.

The ideal combination is a university training giving full opportunities for intellectual development, but employing for this purpose matter of genuine utility value; accompanied by practical experience, giving the young engineer the opportunity of collecting facts from his daily observations and bringing to bear on them the habits of mind acquired in his university training. And, if sufficient time could be allowed for an enlightened course of theoretical training to be followed, there is no reason why either the concurrent or sandwich systems of training should fall appreciably short of this ideal.

The Range of Subjects

It is evident that the subject matter of a young electrical engineer's theoretical training—whether at a university, technical college or technical institution—can only be a very small fraction of the range of knowledge he may hope to acquire in his subsequent career; and a careful selection must therefore be made from a very wide field. Since there are no means of assessing quantitatively either the educational or the utility values of any particular item, the choice is bound to be largely a matter of personal predilection; some slight objective weighting being derived from consideration of the frequency with which use is made of any item in subsequent practice.

The primary necessity of the electrical engineer is a thorough knowledge of electrical phenomena and some experience of their application in industry. This implies a wide basis of mathematics, general mechanics and general physics, followed by an extensive treatment of theoretical electricity. The range of applied electricity, *i.e.*, the actual practice of modern electrical engineering, need not be large since one aspect is sufficient to illustrate and develop those mental processes which the engineer will have himself to apply later in circumstances quite different from those of his training period.

After this prime necessity there are many conflicting claims. A knowledge of the properties of engineering materials and the methods of using them to the best advantage is of very real value to every electrical engineer and must be placed next on the list. Then come the claims of other branches of mechanical engineering, of other branches of modern physics, of chemistry and metallurgy, of industrial economics and of modern languages. All have educational and utility value; and only limitation of available time can justify the omission of any of them. The wider field of physics, the chemistry, the economics and the languages are subjects which if studied at this stage are likely to provide a foundation on which much may be built later. Therefore, they should probably be given precedence to the further study of mechanical engineering subjects.

Too Much Mechanical Engineering?

To what extent do the courses offered at the present time meet these views? In general, mechanical engineering subjects are unduly stressed. Members of the two professions deal with the application to industry of different natural phenomena, and though it is convenient for each to have some knowledge of the other's work, each remains the expert in his own sphere and should be trained with this object. That a few engineers trained in one branch turn to the other should not influence the choice of the best subjects for the training of each of them. A second criticism arises from the fact that there is insufficient choice of subject. There should be much more opportunity for students to choose subjects in which they are interested and much more freedom should be given to the teachers in the choice of the work to be done.

The spontaneous interest of the student and the enthusiasm of the teachers are great factors in the success of the training and neither of these are to be expected where the courses are too rigidly laid down. Standards must, of course, be preserved and some control must necessarily be exercised, but with a suitable choice of alternative subject—in particular, a more extensive subdivision of those aspects of engineering practice used for educational purposes—much could be done. The bogy of specialisation no longer stalks in the world of the electrical engineer because, do what he will, his subject involves wide fundamental knowledge at every turn. It is not, therefore, necessary for the young engineer to devote himself during the limited period of his novitiate to the consideration of a wide range of engineering practice, well knowing that when he attains to responsibility entirely new problems will have arisen.

The provision of these alternatives would undoubtedly call for reorganisation of most of the engineering schools in this country and some degree of co-ordination and mutual arrangement would be necessary. One locality might accentuate one aspect and another a different one, just as naval architecture finds its natural home on the North-East Coast rather than at the older universities or in London. This is not only a matter for electrical engineering but applies to all engineering training, and it is, perhaps, not too much to hope that some combined action on the part of the Board of Education, the universities and the engineering institutions might lead to the sowing of a little seed of co-operation which would do much to help in providing this badly needed improvement.

Practical Training

The object of the practical training is to enable the young engineer to acquire a further store of facts relevant to his particular branch of engineering and to practise his wits on the problems arising from them. These facts fall into two categories: Methods of manufacture and methods of management and of maintaining co-operation between the different parts of the concern which the young engineer has entered. There is in addition an influence which is often stressed, namely, the value of personal contact with the manual workers. This last is difficult to assess for it seems very doubtful whether the relations of management and working staff are appreciably dependent upon contacts established during apprenticeship.

Practical training must be considered mainly, therefore, from the point of view of the technical knowledge acquired by the apprentice. The facts he will ultimately need are so extensive that a mere two or three years of experience in a single works is of little use unless accompanied by extensive reading and the collection of comparative data from elsewhere; a process which is quite impossible if an apprenticeship for young men of this type is regarded as being akin to a trade apprenticeship, but of shorter duration. Manual skill is of little importance under modern conditions though many young men having the true engineering temperament acquire it as a hobby.

Routine work of any kind is almost useless, for immediately a young man becomes a productive agent he is ceasing to learn and the very object of his spending valuable years in this branch of his training is being stultified. The only satisfactory form of apprenticeship appears to be one in which the apprentice acts as an assistant to a more senior member of the staff. This arrangement gives opportunities for frequent change of duties and is, in fact, a reversion to the old system, the part of the journeyman of the old days now being played by the established personnel.

It may be argued that such a scheme is impossible since it involves responsible members of the staff spending valuable time on their junior assistants. The reply to this argument is that if the senior man has the executive ability justifying his responsibility, he quickly finds ways of using his young assistants' brains to advantage. Moreover, under a scheme of this kind the assessment of the ability of the younger men is made by seniors capable of sound judgment and not, as is now so often the case, by men less well-informed. That some of the time of the senior men is required is quite true but this is far more than compensated for by the fact that their intimate contact with the juniors enables them to choose their permanent assistants with a certainty of suitability for their duties which is not possible under any other conditions.

Is All Well?

It is certainly not possible to express unqualified approval of the present arrangement for either the theoretical or the practical training of electrical engineers. The theoretical training is inflexible and unduly costly owing to lack of co-operation among the engineering schools and the practical training is wasteful of time owing to the prevailing idea that the object of apprenticeship is to enable the apprentice to become expert in the routine manual operations of production.

These defects are largely relics of the past and unfortunately there is little tendency to correct them by regarding theoretical training, apprenticeship and subsequent engineering experience of ever-increasing responsibility as one continuous process of development, all the parts of which dovetail into one another and no parts of which are in any way antagonistic.

Space does not permit of a similar examination of early education. Had it been possible, it is to be feared that similar criticism would be unavoidable. The whole system requires careful examination from a strictly realistic point of view.

A Coventry Electrical Ball

The joint social committee of the Coventry Electricity Department staff and the Coventry branches of the Electrical Development Association and the Electrical Association for Women is to hold its first electrical industry ball, at the new Rialto Casino ballroom, Radford, on Thursday, November 19th, at 7.30 p.m. The tickets are 7s. 6d. each, including supper, and applications should be made not later than November 5th to Mr. A. A. Harris, hon. secretary, Electricity Department, Council House, Coventry.

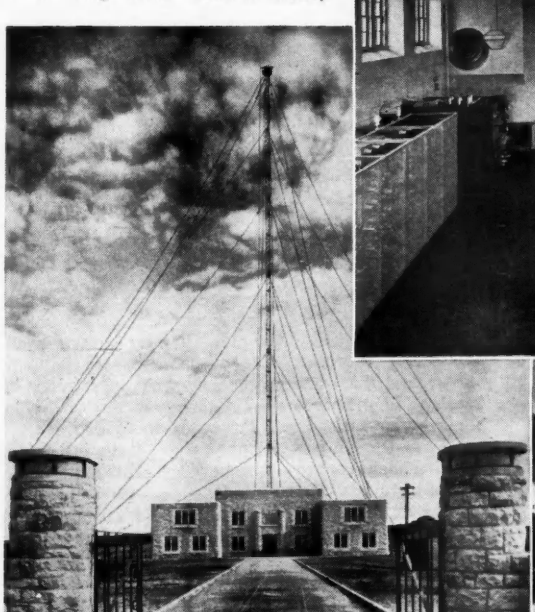
A New B.B.C. Transmitter

The most northerly broadcasting station in Britain

THE site of the Burghead transmitting station of the British Broadcasting Corporation, which was officially opened on Monday last, is on the coast of the Moray Firth, between Elgin and Forres, in the north of Scotland.

This new station has been designed to serve, by paths of lower attenuation over the sea and relatively low-lying country, such highland areas as are screened by mountainous country from the Scottish Regional (Westerglen) and Aberdeen transmitters. There are no actual aerial wires, as the "Eve" mast itself is the aerial from which most radiation takes place in a horizontal direction (the "ground wave") so that by reducing the "sky wave" the maximum non-fading range will be obtained.

The high-frequency energy from the Marconi transmitter is fed by means of a Marconi concentric tubular feeder-line system to an aerial transformer house situated at the base of the mast, and thence to the mast aerial itself, the height of which is 500 ft. The plan and lay-out are similar to those of the Northern Ireland Regional station. The building is of rough-hewn natural stone, single storey, except for the office block at the front. The transmitter is similar in all respects to that at Lisnagarvey, and the general circuit design of both resembles that of the long-wave national transmitter at Droitwich, the same (Marconi) system of modulation being employed. The power delivered to the aerial is 60 kW and the wavelength is 391.1 metres (767 kc/s), the same as that of the Scottish Regional. The method of synchronising the two transmitters is the same as that used at the London, West and North National transmitters. The Burghead transmitter is driven by an electrically maintained tuning fork which, in turn, is controlled by the master tuning fork at Westerglen, to which it is linked by land-line.



Left: Exterior of the new station and the mast. Right: Engine room, showing power switchboard and stand-by Diesel set. Top: General view of the transmitter hall from above

The front part of the building contains the offices, staff rooms and stores, a quality checking room and the control room in which are terminated the land-lines from Aberdeen, and amplifiers which increase the programme strength to that necessary for the input to the transmitter. There is also a studio for emergency use and testing.

The input arrives from Glasgow or Edinburgh by P.O. cables, *via* the Aberdeen studio premises. At a modulation depth of 90 per cent., the total harmonic content does not exceed 4 per cent. In the main amplifying stage there are two 30-kW water-cooled valves, one being connected on each side of the push-pull circuit. There are actually six valves in the output stage, four of them acting as spares, two on each side of the circuit. For the spare valves provided in each stage of the transmitter the usual system of interlocking is employed.

The appearance of the plant differs considerably from that of other B.B.C. transmitters except the one at Lisnagarvey. Instead of being built in several small units, it is constructed in one large unit which is sub-divided internally. The Rosser & Russell valve-cooling system includes a large radiator mounted on the roof of the building, through which air is forced by means of a fan. The heated air can be used for warming the building when required.

Electricity is obtained from a ring main of the Grampian Electricity Supply Co. through a sub-station on the site. As a stand-by a 600-h.p., six-cylinder Croseley solid-injection Diesel engine driving an E.C.C. alternator has been installed. The transmitter supplies are derived entirely from E.C.C. motor-generator sets. There are two English Electric motor-generators, each capable of giving an output of 400 kW at 20,000 V. One is used to supply the required output of about 200 kW at 18,300 V, the other is normally spare.

The filament of each of the valves in the output stage is supplied from a separate machine. The filaments of the modulated-amplifier valves, which are at 10,000 V above earth in the unmodulated carrier condition, are heated by an insulated generator, the frame of which is supported on porcelain insulators and driven by a three-phase, 440-V motor through a porcelain-insulated coupling. Spare filament-current generators are switched by means of contactors which close automatically when the motor has reached full speed.

With the exception of the main h.v. generators, all motors are started automatically from the control table in the transmitter hall. All field regulators are motor-operated, again from the control table. The only manual switchgear is that for starting the synchronous motors driving the main high-voltage generators.

The James Combe heating system is an accelerated hot-water low-pressure installation. An electrical thermal-storage cylinder is employed, the water being heated in an electrode boiler with a maximum loading of 370 kW.

Other equipment used includes English Electric switchboards, Brookhirst motor starters, Watford contactors, Cressall resistances, Marshall copper gauze screening, Turner and Weston electrical instruments, T.C.C. condensers, Ferranti and J. & P. inductances, Tudor batteries, Electroflo water meters, Reliance intercommunicating telephones, Synchronome clocks and B.I. cables. The cable and wiring installation was carried out by A. E. Sudlow & Co., and the lighting fittings by the G.E.C. and Universal Metal & Neon Works, Ltd.

The Modern Street Lighting Problem

A comparison of three systems

WE recently witnessed in the lighting area of the Canterbury City Council, under conditions designed to be as nearly identical as possible, demonstrations of three street-lighting installations—tungsten filament, mercury- and sodium-discharge lamps with light source outputs as nearly equal as standard equipment will permit.

The wide variations of colour sensitivity of the human eye and the great diversity of opinion among experts as to the meanings of such important terms as glare, definition and even visibility make it impossible to claim that any one system of lighting is better than another in all circumstances, in spite of any evidence given by the photometer. The comparison made at Canterbury should, however, contribute towards "clearing the air" at a time when many important commercial street-lighting developments are about to take

place, including the pending decision or recommendations of the Ministry of Transport with regard to main-road lighting, all interested should see the actual demonstrations.

The demonstration road is a straight length of the London Road outside the city, with a fairly sharp bend at each end. There are 12 columns, 150 ft. apart along the road, *i.e.*, six columns on each side of the road with 300-ft. spacings. Bracketed at 25 ft. above ground level, each column carries a fitting equipped with a 500-W tungsten-filament lamp with a bare lamp output of 7,920 lumens, a second fitting with a 150-W sodium-discharge lamp of 9,600 lumens bare-lamp output, and a third fitting accommodating a 250-W mercury-discharge lamp having a bare-lamp output of 9,000 lumens. The lamps are all separately switched, so that any one lighting system, combination of systems, or any number of lighted lamps can be provided at any one time.

Apart from the slight output differences of the lamps proper, the only reasons we could discern for any variation in overall light output or light distribution were due to differences in the construction of the fittings and the slight differences in their positions on the brackets. The open reflectors are all of the "Bimulti" mirror type, and although they necessarily differ widely in shape to suit the different lamps (round filament, vertical mercury and horizontal sodium), Mr. D. Wilman, chief technical assistant, Electric Street Lighting Apparatus Co., assured us that they were all designed to give maximum and comparable distribution. Evidence of the slight differences in the relative positions of the fittings on the brackets was given by variations in the size and shape of "dark" patches on the road surface caused by the interruption of the light distribution by trees along the roadside.

When first standing at mid-length of the road with white (tungsten) light along one half of its length and yellow (sodium) light along the other half a definite impression was gained of there being more light on the white half of the road. This impression was also felt when making comparisons of the road lighted by each system separately, both with all the lamps in the respective systems alight, and also with the road lighted by the lamps on one side only. The more pleasing picture presented under white light by reason of additional colour may perhaps be responsible for the idea of greater illumination.

Arrangement of alternative demonstration lighting fittings on column brackets

No difference in the "amounts" of light under the sodium and mercury systems was detected, but the difference in the character of the light due to colour made decision difficult on this point. Under each form of lighting we watched from one end of the road a cyclist ride right down the road to the other end. In attempting to draw true comparisons attention was largely focused on definition or clearness of outline of the cyclist and the contrast that he presented with the road surface. In clearness of outline no difference was observed between the tungsten and sodium lighting, but with the mercury lighting the figure of the cyclist became indefinite towards the far end of the road. For the first fifty yards or so he presented more "colour" under mercury than under sodium lighting.

Under sodium light we watched a lady with a white macintosh cycle down the road, and she presented alternately white and black pictures to us. Unfortunately it was not possible to repeat this chance demonstration under the other systems of lighting.

The effect of the different systems at 150-ft. spacing:—1. 150-W sodium discharge lamps. 2. 250-W mercury discharge lamps. 3. 500-W tungsten filament lamps

With the road lighted by lamps on one side only, in the case of both tungsten and mercury, definite impressions were received of both reduced "quantity" of light and less definition of the cyclist, as compared with the full lighting of each system, but no such difference was detected with sodium lighting.

Injuries from Contractors' Plant.

By W. Summerfield, M.A.

Workmen's rights to compensation

THE importance of an efficient lighting installation during the conduct of industrial processes is illustrated by the recent case of *Hawkins v. Thames Stevedore Co., Ltd., and Union Cold Storage Co., Ltd.* (1936); the requirements of the law are stringent, and are not relaxed in cases where the process being carried on is of a temporary nature and temporary lighting for the use of the workmen is resorted to. The Factory and Workshop Act, 1901, provides, by Section 17, that if "any part of the ways, works, machinery or plant used in a factory or workshop is in such a condition that it cannot be used without danger to life or limb," its use may be prohibited, either altogether or until such time as it has been repaired or altered—if it is capable of repair or alteration. The terms "ways, works, machinery or plant" occur also in the Employer's Liability Act, 1880, and the comprehensive interpretation which may be given to such terms has been illustrated in such cases as *Willetts v. Watt & Co.* (1892), where the floor of a workshop was held to be a "way"; again, loose planks temporarily used in the course of the erection of machinery, as well as staircase openings, have been held to be "ways" in *Giles v. Thames Ironworks Co.* (1885) and *Bromley v. Cavendish Spinning Co.* (1886).

What is a "Factory"?

Section 104 of the 1901 Act provides that the restrictions referred to as applicable to "dangerous machines" are to be applied as if "every dock, wharf, quay and warehouse and all machinery or plant used in the process of loading or unloading or coaling any ship in any dock, harbour or canal were included in the word 'factory,' and the purpose for which the machinery or plant is used were a manufacturing process"; and "as if the person who by himself, his agents or workmen uses any such machinery or plant . . . were the occupier of the premises"; and "for the purpose of the enforcement of those provisions the person having the actual use or occupation of a dock, wharf, quay or warehouse or of any premises within the same or forming part thereof and the person so using any such machinery or plant shall be deemed to be the occupier of a factory."

Section 104 goes on to define the term "plant" as including "any gangway or ladder used by any person employed to load or unload or coal a ship." Ships have been held to be "factories" within the scope of these legal rules, which are designed to secure the safety of workers, in numerous cases, including *Raine v. Jobson* (1901), which went up to the House of Lords. Contrariwise, mere distance from the water, it was held in *Kenny v. Harrison* (1902), will not of itself prevent a particular area from being a "wharf"; mention may also be made of the case of *Ellis v. Cory & Son, Ltd.* (1902), where it was held that a structure moored in a river and disconnected from the store place might still be termed a "wharf."

Inadequate Lighting

The principles dealt with, therefore, in *Hawkins's* case, it will be seen, are widely applicable to factories and workshops in general. The plaintiff Hawkins sued the Thames Stevedore Co., Ltd., and also the Union Cold Storage Co., Ltd., for damages in respect of personal injuries sustained by him due, as he alleged, both to negligence and to breach of statutory duties on the part of the two defendant companies, and he was awarded £800 with costs against both of them.

The circumstances in which he sustained his injuries were as follows. A ship, after unloading, was lying in dock and Hawkins was working in it, engaged on replacement of the insulation of refrigerator pipes; he was employed by a company which was independent of the first-named company, who were the stevedores engaged in discharging the cargo, and of the second-named company, who were the owners of the ship. Hawkins was working on the shelter deck, and after the gang had replaced all the hatch covers one had been left off for the purposes of ventilation; the shelter deck was illuminated by electric lamps in portable groups, but in the vicinity of the hatch which was left open the area was very dark; the fencing of the hatchway was loose, and Hawkins fell into the hold.

The plaintiff relied, in support of his allegation of breach of statutory duty against the defendants, upon the Factory and Workshop, Dangerous and Unhealthy Industries, Regulations (Statutory Rules and Orders, 1934, No. 279) Regulation 12, which requires that where any process of "loading, unloading, moving or handling goods" is being carried on, the places where the work is being carried on shall be "efficiently lighted."

The Judge held that the plaintiff's contention that the process of unloading continues until the hatch covers are replaced was sound, and that the argument of the defendants was unsound when they contended that the process is at an end—if a further stage must have been completed—when the cargo has been removed and the covers have been replaced or the fencing of uncovered hatches, as required by Regulation 37, has been executed. He relied upon the decision of the House of Lords in *Lysons v. Andrew Knowles & Sons, Ltd., Stuart v. Nixon & Bruce* (1901).

In *Lysons's* case a vessel was being loaded by means of machinery, and after the cargo had been placed in the hold the workmen employed by the stevedores were finishing off by slinging iron beams across the hatchway; the machinery became entangled and a workman, whilst disentangling it, was caught up in it and suffered fatal injuries; the House of Lords held that the stevedores were at the time occupying a "factory" within the meaning of the Acts.

The learned Judge concluded that in *Hawkins's* case, at the time when the plaintiff met with his accident, the process of unloading was in process of completion, and that so long as it remained uncompleted the ship-owners were continuously obliged to comply with the requirement with regard to efficient lighting. That obligation they had failed to discharge.

The stevedores, further, as "invitees," were under a common law duty requiring them to warn any other "invitees" working upon the same "factory" premises of any dangerous situation created by them, and in this case it was in evidence before the Court that the stevedores' ganger knew that there were workmen engaged on the shelter deck when he was putting the plugs on and he ought to have been aware of the condition in which the fencing was, but he provided no warning; the ganger also knew that by closing the main hatches he would shut out daylight.

Liability for Compensation

Another important issue in connection with the use of electricity frequently arises where compensation is claimed under the Workmen's Compensation laws: the Workmen's Compensation Act, 1925, provides, by Section 6, that where a principal enters into an agreement with a contractor for the execution by that contractor of any work undertaken by the principal, then the principal is to be liable to pay compensation under the Act to any workman employed in the execution of the work, just as he would have been liable to pay it had the workman been directly employed by him; but in certain cases, if the contractor provides and uses "machinery driven by mechanical power" for the purpose of such work, then the contractor alone shall be liable to pay compensation.

The expression "machinery driven by mechanical power" has been judicially considered in *Wrigley v. Bagley* (1901) and *Wilmott v. Paton* (1902). In both those cases it has been held that the "power" in question must be such as is derived from electricity or steam, water, gas, or some similar force, and does not include hand power or horse power, even if such is augmented by some mechanical contrivance. In *Wrigley's* case, a firm of engineers had contracted with a firm of cotton spinners for the supply and fixing of a new driving wheel for the steam engine in a cotton-spinning factory; in order to lift the new driving wheel a hand-winch and pulleys were used, and Wrigley was directing that operation when he met with a fatal accident, and it was held that the workman's widow could not claim compensation, the machinery used not being "driven by mechanical power." In *Wilmott's* case, a travelling crane was set and kept in motion by hand power, and the Court of Appeal again held that there was not there "mechanical power."

Section 6 of the 1925 Act does not apply in any case where the accident occurred "elsewhere than on, or in, or about premises" on which the principal undertook to execute the work or which "are otherwise under his control or management." The phrase "on, or in, or about premises" was subjected to judicial examination in *Back v. Dick, Kerr & Co.* (1906), where it was held that a workman engaged in unloading tramway lines some seven hundred yards away from the site of existing work, who met with an accident, had not suffered his accident "about" the premises.

Nevertheless, to the term "premises" a wide interpretation is very often given, as in *Rogers v. Cardiff Corporation* (1905); there the defendant Corporation owned a system of electric tramways and Rogers, the plaintiff, was engaged in repairing the overhead wires. He met with an accident, in respect of which he claimed compensation, after repairing wires by means of a tower-wagon; he was proceeding along a street following the line of the tramway to another place where wires were to be repaired, when he was thrown from the wagon and suffered his injury; and the Court of Appeal held that each act of repair by the workman could not be treated as a separate engineering work, so that the accident could be said to have occurred within the area of the engineering work on which the plaintiff was employed.

Correspondence

Contributions from readers are welcomed. The reader should give his name and address, not necessarily for publication

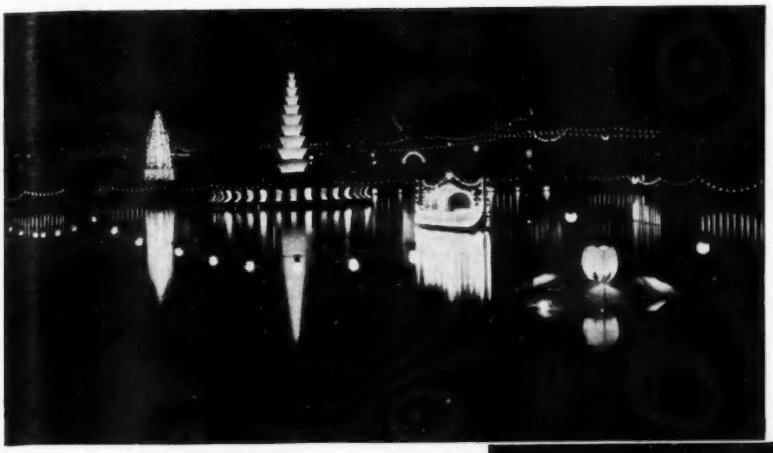
A "League of Notions"

This item from the article "Are We Doing our Best?" in your current issue is interesting, but, like the League of Nations, its work without power to enforce its findings would be useless. An instance of this is the new Meters Act by which the law makes accuracy compulsory. What a stir it has made! So-called engineers and managers are now taking keen interest in their metering whereas previously any old sort of check apparatus was sufficient.

This shows the progress which can be made when the law compels things to be done, and indicates that a "League of Notions" would be useful if its decisions could be backed by law.

If such a society existed I am sure its first duty would be the fixing of a time limit for the extinction of the electricity committees who still dominate distribution; then real progress would ensue.

October 12th. TRAVELLER.



Two views of the electrical illuminations at Sunderland, a note concerning which appears on page 545

Low Salaries for Engineers

To the classes of applicants enumerated by "Peccavi" an important one is to be added—engineers engaged in the design and manufacture of electrical apparatus. The engineering knowledge and experience possessed by such men is valuable; it is a common experience of any of them to be consulted through their firms by corporation engineers in connection with some quite elementary problems which have nevertheless been too much for these municipal supply men.

This is easy to account for: the corporation engineer, unless he has previously had manufacturing experience, can get along with just enough engineering knowledge to follow instructions given him by the suppliers of the apparatus under his charge; he can call upon the latter when he is faced with any difficulty. Any engineering ability he possesses over and above this requirement is a luxury but not a necessity. But the designing engineer must be thoroughly familiar with the properties and usage of electrical apparatus to be able to discharge his task at all; and under the competitive manufacturing conditions of to-day he must not only discharge it but must do so highly efficiently.

Yet the designing engineer is rarely able to command a salary comparable even with those offered for the "banned" posts. Whatever explanation may be given for this, has any one a right to suggest that he must not apply for or accept such posts in order to better himself? If he applies, he is still faced with difficulty in convincing the council concerned of his competence; usually he is not in a position to supply any recent testimonials for obvious reasons, and unless the councillors happen to be aware of the situation, his application is likely to receive no consideration. Possibly this accounts for some of the discrepancies in salaries to which the municipal engineers' associations have objected.

The existence of such a class of applicants proves either that the salaries demanded by the A.M.E.E. and E.P.E.A. are scandalously high or that the men upon whom we really rely for our engineering work are being scandalously robbed. If "Peccavi" holds that the latter is the case, his letter is logical; but what objection then is there to applicants of this class being engaged? MAN WITHOUT A UNION.

October 12th.

Your correspondent "Peccavi" writing on "Banned Positions," has classified with great clarity the types of corporations that endeavour to obtain "cut-price" chief engineers. But what of the manufacturing side of the industry?

There is no organisation such as the E.P.E.A. to protect the interests of engineers or one would be spared the pain and humiliation of reading an advertisement for a *graduate* engineer "under 25," who is to be offered the princely salary of £2 per week for his services. We ourselves are largely to blame!

It is high time that conditions were established to render it impossible for responsible electrical journals to print such advertisements. ELECTRICAL ENGINEER.

October 9th.

Interference-free Radio

A letter of mine appeared in your correspondence columns of August 1st in which I stressed the injustice of the design and cost of suppressing radio interference being borne by the manufacturer.

Mr. Bligh in your issue of October 9th takes pains to open his article with the following: "... a practical way has been found of dealing with this difficulty [suppression of interference] in a manner which has taken care to cast only a legitimate share of the burden on the manufacturers." Will Mr. Bligh inform me what share of responsibility the elimination of noise from radio reception is being borne by the radio manufacturers?

The question of the cost of apparatus for suppression is not all my argument, as the manufacturer will, of course, have to charge more for his plant, &c., to cover this; my point is that the design of the suppressors, which vary for various applications even on the one series of product, *is* not the job of the manufacturer.

Are we to assume that the set makers are not capable of solving the problem at the set? If so, surely the B.B.C. or the G.P.O. are the competent authorities to design, and even market and fit them. If we can judge by the programmes provided, very little of the licence receipts are spent on them, so perhaps the surplus can be put to the solving of this suppression difficulty.

To saddle the manufacturer, as is evidently the recommendation of our own I.E.E. Committee, with the design and testing necessary to render his apparatus non-interfering, is again, I maintain as in my previous letter, a gross evasion of responsibility.

London, S.E.22, *October 10th.* HAROLD E. JOHNSON.

Remote Control of High-voltage Switchgear

The dangers attending the explosion of a high-voltage switch, such as that reported this week, raises the question as to whether the remote control of such switches should not be made compulsory in the interests of the operators. At many of the small generating stations which have recently been closed down, a small truck-type switchboard is fed from a bulk-supply sub-station. In those I have visited the engineer or attendant has to operate the gear by hand while standing in front of it and very frequently he is the sole occupant of the station.

Supply has to be restored as quickly as possible, but a man may think twice about closing a circuit-breaker that has opened with all relay time-limit fuses blown. Yet if the feeder is afterwards found to be sound he would probably be reprimanded for not closing up at once. Here is surely a case for remote control, but I know of 22-kV switchgear that is being installed in London and the suburbs with no such provision.

Again, a mains engineer may be called out at night to reclose a switch by hand in an underground chamber the only means of exit from which is an iron ladder and a manhole. Remote control could be arranged from a pillar on the pavement. For a lock-up sub-station on the surface, an 18-in. wall separating the switchgear from the control panel should be provided.

I am at present in charge of a large London sub-station where, although remote-control closing and tripping gear is fitted, the controls are mounted on the front of the switch. The trunk mains are all closed by hand. On some of the local feeders the load is over 2,000 kW.

I feel that I voice the opinions of all in a similar situation in pointing out to those responsible that it is time something was done to make our stations safer, which is particularly necessary when only one or two men are working at a time.

October 7th. Station Engineer.

Electrical Traders and Share Offers

In a recent "Offer for Sale" of an electrical concern's shares the issue was over-subscribed to such an extent that applications for fewer than 500 shares were not entertained. This, of course, is very satisfactory for those who made the offer, but I feel that the company lost an opportunity of inviting the trade to participate in its fortunes. A stipulation could have been made to the people who conducted the transaction that preference in acceptances was to be afforded to electrical trade applicants.

It seems a little surprising that such an exceptional opportunity to enlist practical goodwill was allowed to slip past, and I would suggest to those who have similar schemes under consideration that preference should be a *sine qua non* so far as the trade is concerned. W. G. B.

October 10th.

The E.I.B.A. Million Pound Fund

The Manchester and District E.I.B.A. Area Committee have decided to shoulder their quota of £200,000 of the Association's £1,000,000 fund.

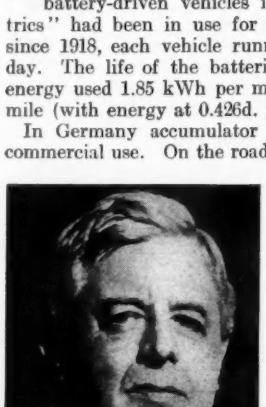
What are Scotland, Ireland, Wales, North-East Coast, Lancashire, East Midlands, Birmingham and Liverpool going to do about it? A. Hugh Seabrook, *Executive Officer*,
Electrical Industries Benevolent Association.

London, W.C.1, *October 7th.*

Road, Rail and Fuel

In his presidential address to the Institute of Fuel yesterday, Sir Philip Dawson, M.P., stated that there were 1,890 battery-driven vehicles in this country in 1935. "Electrics" had been in use for collecting refuse in Birmingham since 1918, each vehicle running an average of 15 miles per day. The life of the batteries was thirty-eight months, the energy used 1.85 kWh per mile, and running costs 1.63d. per mile (with energy at 0.426d. per kWh).

In Germany accumulator road and rail vehicles were in commercial use. On the road with an average speed of twenty miles per hour the battery of a 3-ton lorry capable of negotiating short inclines of 1 in 8 was composed of twenty cells and ran forty miles to a charge. The German Post Office was using 2,400 battery vehicles for house-to-house deliveries. In the same country Diesel-electric trains were running on routes with gradients of as much as 1 in 40, which they negotiated at 40 m.p.h. Their thermal efficiency was 28 per cent., compared with 10 per cent. for the best steam locomotives.



Sir Philip Dawson, M.P., the President of the Institute of Fuel

In the United States many Diesel-electric trains were in service; some of those on the 144-mile line between Kansas City and Lincoln had run 200,000 miles at a maximum speed of 100 m.p.h.

Useful steam locomotive work averaged only 4½ hours per day for periods of service of from six to ten days and the average thermal efficiency in operation was only 2¼ per cent. Fuel consumption varied in different countries with the prevalent conditions; in Great Britain it was 52 lb. per engine mile, in France up to 75 lb. and in the United States 161 lb.

On the Continent there were 11,000 route miles of main line electrified, but the most complete single system was that of the Pennsylvania Railroad between New York and Washington (364 route miles), over which 686 trains of all classes ran daily, involving a consumption of 800 million kWh per annum and average speeds of 76.6 m.p.h.

Progress on the Continent

In Germany speeds up to 68.5 m.p.h. were obtained on electrified lines, the longest non-stop express (between Stuttgart and Munich) travelling 149 miles over gradients of one in forty at an average speed of 52.6 m.p.h. The 300 miles of line from Modane to Rome was now electrified, and shortly the 330 miles between Paris and Irun and the 500 miles between Berlin and Salzburg (*via* Dresden and Munich) would be.

The principal success attending the long-distance electrification schemes of the Southern Railway had, nevertheless, not resulted in the L.N.E.R. following its example (except in regard to the requirements of the London Passenger Transport Board) even for its Southend service. Main-line electrification entailed considerable reduction in the coal required for haulage. The Orleans Railway Co. stated that 1 lb. of cheap coal consumed in a generating station was equivalent to rather more than 4 lb. of the more expensive coal required for the steam locomotive. For the same service the weight of an electric locomotive per kW was 100 lb., compared with 210 lb. with steam, and German experience was that one of the former would replace two and a half steam locomotives. In 1934 the German railways took 12 million tons of coal (10 per cent. of the total output as against 5 per cent. in Great Britain). The length of German lines for which electrification was contemplated handled 50 per cent. of the total traffic, and about one-third of the electricity would be produced from water power. The consumption at 55 Wh per gross ton-mile at the power stations corresponded to 0.082 lb. of coal, or one quarter of that needed by the most modern steam locomotives.

The annual decrease in coal consumption due to railway electrification in Austria, Sweden, Switzerland and Germany (which took in all 2,140 million kWh per annum) amounted to two million tons. In Great Britain the consumption of coal for the railways had fallen from 13.4 million tons in 1929 to 12.5 million tons in 1934 (as road traffic had increased), while the average consumption per engine mile fell only from 54.02 to 52.37 lb. The increase of the commercial efficiency of our railways depended less on improved design of steam locomotives than on better methods of operating traffic, especially goods and mineral.

Electrometallurgy in the U.S.A.

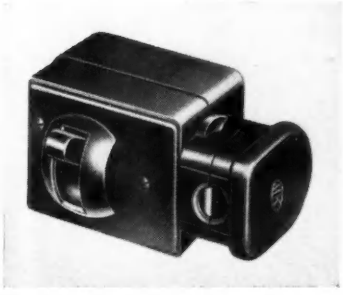
Further details have been published on the electrometallurgical experimental factory that the U.S. Bureau of Mines has erected in Boulder City, states the *Chemical Trade Journal*. In the first place, the question of whether electricity can be produced cheaply enough by hydro-electric power from the Boulder Dam plant to make the manufacture of electrometallurgical products a commercial possibility will be investigated. Then the methods for the production of manganese, chromium, molybdenum, tungsten, cobalt, nickel, magnesium, iron, aluminium and their alloys will be worked out. Another investigation will cover the possibility of the electrometallurgical conversion of chromium ores in the presence of iron sulphides and copper into high-grade alloys. One of the most interesting of the investigations, however, reference to which has already been made in these columns, will be that on the direct electrolytic production of manganese from certain low-grade ores.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Combined Switch-sockets

A 2-A combined switch-socket is a recent product of M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, London, N.18. It is of robust design and has a recessed back for easy wiring and the latest type of plug employing an effective cord grip. Overhang is impossible—that is to say, one pin of the plug cannot make contact with either the "live" or the neutral socket whilst the remaining pins are exposed.



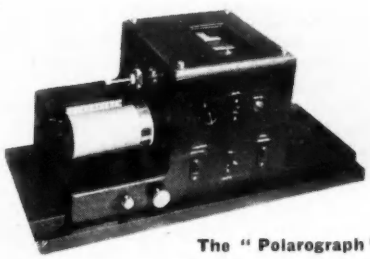
The new M.K. 2-A switch-plug

Another new line is a dual socket in which are embodied 15-A and 5-A sockets with protective fuses. The special feature of the combined dual socket is that it allows a power lead and a lighting lead to be taken from one wired point. The 5-A socket is protected by double-pole cartridge-fuses in the base and thus the safety of the smaller appliance is assured. The sockets are made to B.S.S. 546 for interchangeability and safety, and the dual arrangement complies with the diversity factor in the I.E.E. Regulation No. 4D (Amendment.)

Instead of a 5-A socket a similar arrangement can be provided with a 2-A socket. Screens are fitted to both outlets and overhang is eliminated. An illustration of this fitting appeared on page 497 of our issue of October 9th.

Electro-chemical Analysis

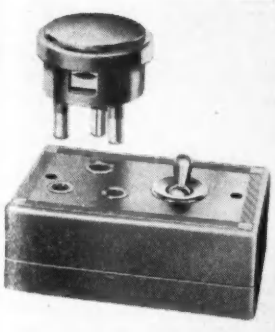
The "Polarograph," which is being introduced into Great Britain by MESSRS. W. EDWARDS & CO., LTD., Vaughan Road, Loughborough Junction, London, S.E.5, is to enable speedy analysis (five to ten minutes) of solutions, especially those containing small quantities of valuable substances, and to record automatically the nature and quantity of the ions. It is possible for the solution to consist of several components, and all portions of the mixture that are cathodically reducible may be determined. The substance to be analysed may be up to 0.1 cm³ and the solutions diluted up to 10^{-7} times the normal.



The "Polarograph"

Switches and Switch-sockets

Included in the latest catalogue of MESSRS. J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall, are new three-pin "non-overhang" plugs, sockets and switch-sockets. Two forms are available, a shrouded pin rectangular plug and "non-overhang" rectangular socket, and a "Compact" switch-socket with a "non-overhang" cover and round, shrouded-pin, flat-top plug. Another new development is semi-recessed units in multi-gang form with a teak front.



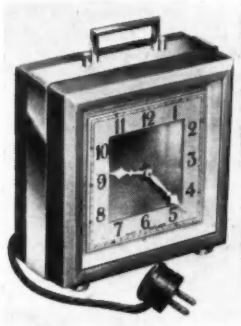
"Compact" switch-socket with "non-overhang" cover and round, shrouded-pin, flat-top plug made by Messrs. J. A. Crabtree & Co.

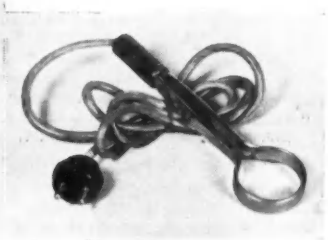
Decoration Lights

For the forthcoming season the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, is marketing three novel sets of decorative lights. "Mickey Mouse," "Donald Duck," "Pluto" and other Walt Disney characters are portrayed in coloured action scenes on special non-inflammable translucent shades of various delicate pastel tints.

Bell and star lights are another product for Christmas decorations, while fairy lights can also be obtained, a special device known as "Berry Beads" enabling each lampholder to be separately and quickly secured to the branches of a Christmas tree.

Both the "Mickey Mouse" and "Bell Star" lights are fitted with a special combined plug top and lampholder adaptor.





Left: The new Smith's "Lark" synchronous alarm clock. Below: A Ward & Goldstone immersion heater

Load Indication

The P. & B. "Superscale" load indicator has been designed by the "P. & B." ENGINEERING CO., LTD., Tamworth Lane Works, Mitcham, Surrey, primarily for ascertaining whether plant or cables in unattended sub-stations are at any time loaded to their full capacity. The average maximum load is indicated by the idle needle and, due to a time lag of ten minutes, the instrument is almost entirely unaffected by momentary overloads. On the other hand, heavy loads of a few minutes' duration appreciably increase the maximum reading so that the idle needle shows approximately the average maximum load.

The movement consists of two bi-metal coils with temperature compensation. The scale length is 4¾ in. and is open at the top end.

The P. & B. road indicator

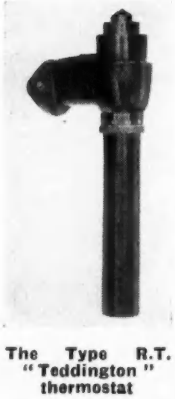
The instrument is intended for current-transformer operation, and has a nominal full load of 5 A with a maximum scale value of 6 A. The burden at nominal full load is 5 VA so that it is suitable for operating from any standard 5-VA transformer. The accuracy is "second grade" in accordance with B.S. Specification No. 89 for indicating ammeters for use with transformers.

A dual-range type, fitted with a special heater to give full scale deflection at 3 A and 6 A is available for use in sub-stations where the load on some of the plant or cables is initially light, but is likely to increase rapidly. The switchgear may be equipped with standard 5-A current transformers and while the load is less than 50 per cent. of the maximum capacity, the 3 A range ensures an accurate check

Left: A "Quick-Boiler," introduced by the Cooper-Stewart Engineering Co., Ltd., designed to boil 3½ pints in 7 minutes with a 1,200-W element. An optional loading is 1,800 W. Right: A breakfast cooker of Elexcel, Ltd., with a full loading of 1,250 W and a simmering position of 400 W.

E

on the load and the rate of increase. When the load reaches that point only external connections need be changed. The standard finishes are either bright or dull black with chromium-plated resetting knob.



The Type R.T. "Teddington" thermostat

A Room Thermostat

The type R.T. "Teddington" room thermostat of the British Thermostat Co., Ltd., Sunbury-on-Thames, which was briefly described in our last issue, is intended particularly for wall mounting in private houses. It is of neat design, and as the temperature-sensitive element is held away from the wall it is influenced by the temperature of the room and not that of the wall. The element is housed in a vertical tube to take advantage of and promote the flow of convected air currents, the casing being obtainable finished in ivory and black or ivory and walnut. An adjustable scale from 45 to 75 deg. Fahr. is provided, there being a differential of 3 deg. on the standard setting and one degree on the fine setting. The rating is 10 A a.c., or 1 A d.c., up to 250 V.

Spectacular Stage Lighting

The stage production, "Let's Raise the Curtain," which is being produced at the Victoria Palace, London, has been chosen as the occasion to introduce a spectacular lighting system developed by Mr. J. L. Van Os. Upon the black-out of all the normal stage lighting the scenery and dresses immediately assume vivid colours of yellow, green, orange, red, blue or gold. The effect is produced by treating the scenery, &c., with a chemical substance (not luminous paint) which appears phosphorescent when subjected to ultra-violet rays of a certain wavelength emitted by specially designed mercury vapour lamps of the mechanical quartz burner type. Filters fitted to the lamps eliminate all visible rays, yet the articles treated attain a luminosity sufficient to enable a person close by to read. This luminosity is retained for quite an appreciable time after the lamp has been switched off. For the Victoria Palace installation six 250-W u.v. lamps are used. The range of this type is approximately 12 ft., but a 70-ft. throw has been achieved with 5-kW models. The system, for which the sole rights have been taken up by the Dominion Electrical Co., Ltd., 5, Upper Marylebone Street, London, W.1, appears to have further possibilities for advertising signs, &c., and investigations are being carried out with regard to its application to Coronation street schemes.

A Reflector Lamp

The "Reflexon" lamp which is claimed to improve efficiency has recently been introduced by the Terrell Industrial Cpn., Aldwych House, Aldwych, London, W.C.2. It is mushroom-shaped and is equipped as standard with an adjustable reflector which fits over the neck of the lamp. It is adjustable to any position on the neck of the lamp, and it is in sprung contact with the upper half of the lamp.

Either clear or satin obscured glass can be obtained, and replacement lamps can be purchased.

The "Reflexon" lamp with removable reflector

Salt-bath Furnaces.

By A. J. G. Smith

Increased safety through the use of internal heating units

THE salt-bath type of furnace has made great progress during recent years, not only for carburising, but also for tempering, annealing and general heat-treatment work, both of aluminium alloy and steel parts; among the latter may be mentioned particularly the tempering of large springs for the motor car industry. In this country most salt-bath furnaces have been of the gas-fired type, but electric heating has certain important advantages which are especially apparent in the case of processes such as tempering and annealing, involving the use of salts with a potassium nitrate content (saltpetre) when it is necessary to ensure immunity from explosion.

When such a furnace is externally heated there is always this risk if the molten salt should come into contact with the highly heated furnace wall through leakage. The risk is increased when the furnace is oil- or gas-fired, as the refractory furnace walls in such cases are liable to have a slight coating of carbon deposit (in which there may be a certain sulphur content) due to the fact that it is customary to operate the furnaces with a reducing atmosphere so as to avoid undue wear of the bath or crucible.

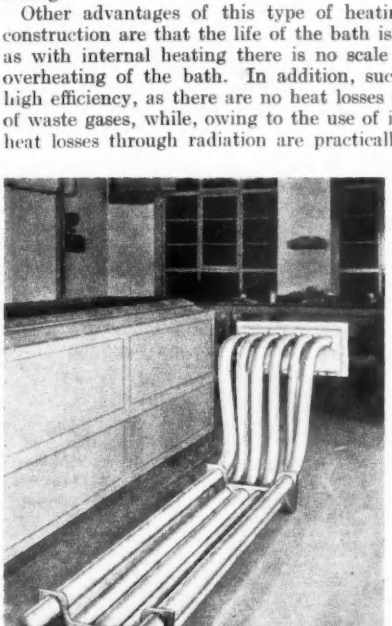
A German System

A considerable amount of experimental work has been carried out in Germany with the object of preventing such explosions, and for tempering and other processes involving temperatures between 150 and 550 deg. C. an internally heated electric furnace, known as the Kaercher type, and made at the Durferrit Works, Frankfurt, has been evolved, which effectually overcomes this drawback.

In general construction it consists of a strong, welded inner bath encased in a lighter sheet-metal envelope built into the customary furnace outer casing, lined with insulating material which is extended so as to come into contact with the outer envelope of the bath. Heating is effected by tubular elements laid along the bottom of the bath and vertically at one or both ends, according to the size of the furnace. An alternative method is adopted in the case of very deep baths, in which case the elements are placed one over the other along both sides of the bath. The electric heating elements are contained in tubes, and can be removed or replaced without removing either the tubes or the bath. The tubes themselves are made of special acid-proof material, and are covered with a sheath of pure nickel. Various methods of automatic temperature control can be fitted so as to do away with the necessity for attendance during the heating-up period and to ensure the maintenance of an accurate temperature within very close limits.

Even if a leakage should occur through the inner and the protective bath the insulation with which the melt would come into contact would be at a lower temperature than the bath, so that the salts would solidify and thus prevent further leakage.

Other advantages of this type of heating and method of construction are that the life of the bath is greatly prolonged, as with internal heating there is no scale formation or local overheating of the bath. In addition, such a furnace has a high efficiency, as there are no heat losses through the escape of waste gases, while, owing to the use of insulating material, heat losses through radiation are practically negligible. This latter point is a factor which adds to the comfort of the personnel as well as the efficiency of the furnace.



Internal heating units for a salt bath

Large baths, with separate heating elements on each side, have been built with a removable dividing partition down the middle, permitting one-half of the bath to be used at a time. This is advantageous in works where the normal output consists of small parts with an occasional large part for which the whole of the bath is required.

This method of heating has been strongly recommended by the German Central Aluminium Association for the heat-treatment of aluminium alloys, and with the growing extension of salt-bath furnaces to further processes and products there is undoubtedly an increasing field for the use of electrically heated plant on the score both of safety and convenience which is deserving of special attention.

Domestic Supply in Canada.

A general survey of the position

By A. S. L. Barnes

IN Canada, as in other parts of the world, the depression out of which some countries, at least, are now emerging has not been wholly a bad thing, for it has indicated very clearly to electricity supply authorities that the domestic load is much more stable than the industrial load, and has spurred them on to develop it a great deal more actively than they were inclined to do during the years when industry of all kinds was flourishing.

Campaigns, vigorously prosecuted, to induce more and more domestic consumers to install electric water-heaters, ranges (cookers), washing machines, ironing machines, coal-furnace blowers, &c., as well as to increase the standard of illumination (under the slogan " Better Light—Better Sight ") have been put in hand by the more progressive electrical utilities and are resulting in increased sales of electricity.

Regions of Greatest Activity

As might be expected, the greatest activity and the most important results are to be found in the provinces of Quebec, Ontario, and British Columbia. In Quebec, Montreal Light, Heat and Power Consolidated (which controls many other companies), the Southern Canada Power Co., and the Shawinigan Water and Power Co. are the chief active agents. The Hydro-Electric Power Commission of Ontario has been doing a great deal during the past two or three years to develop the domestic load in its area, while in British Columbia the B.C. Power Corporation, through some of its subsidiaries, has been promoting this type of load to a certain extent by reducing domestic rates for supplies and in other ways.

In the Maritime Provinces, New Brunswick and Nova Scotia there has not been much done outside of the larger towns. In the West, with the exception of the city of Winnipeg, Manitoba, which for years has been a leader in fostering the domestic load, matters have been moving more slowly, probably due partly to the almost complete failure of the crops in large areas both in Alberta and Saskatchewan, although the fact that most of the towns are small and scattered, in all three Provinces, is in itself a bar to the effective carrying out of campaigns such as those referred to.

The following notes illustrate the work that is being done in the domestic field. Available information indicates that public ownership, as represented by the Hydro-electric Power Commission, has pursued the campaign somewhat more intensively than any of the companies.

Although the bulk of the output of the Shawinigan Water and Power Co. goes to industries and electric traction, the company serves, exclusive of the island of Montreal and the district of Quebec (city), 390 municipalities, many of them small, in the Province of Quebec. The total number of consumers exceeds 66,000. The company operates fifteen merchandising stores, handling all kinds of domestic electrical equipment such as ranges, water-heaters, refrigerators, radios, vacuum cleaners, washing machines, lamps, &c.

Cooking and Water Heating

A rental plan for ranges has been in force for the past three and a half years. Two types are available on a rental plan at $1.25 per month, installation and service being provided by the company. Contracts are made for at least one year, and the average rate for range service is approximately two cents per kWh. Range saturation is approximately ten per cent.

It may be remarked here that, in the Province of Quebec—outside of Montreal, Quebec (city) and possibly one or two other urban centres where gas is available as a competitor of electricity—the people are very conservative and use wood almost exclusively as a fuel. On the whole, it seems likely that electricity supply companies, dealers and other interested persons, in spite of the real effort put forth, will find it rather more difficult to make headway with the French-Canadian population of Quebec than will their confrères in Ontario where the people are more ready to adopt new ideas.

The storage type of water-heater operating on the off-peak principle, with time-switch control, is supplied to consumers on a rental purchase plan. A 50-gal., 2,000-W thermostatically controlled unit is supplied at $2 per month for seventy-five months, or a 33-gal. 1,500-W heater at $1.50 per month for eighty-five months. An allowance of $30 is made toward the cost of installation. The net off-peak rate is 0.8 cent per kWh.

The company finances house wiring, a charge being added to the monthly bill. Installations are connected to the company's lines free of charge up to a distance of 100 ft. A bonus of $5 is given to local electricians for every wiring contract obtained and one of $2.50 to employés of the company for like service.

A lighting bureau operated by the company is active in domestic, commercial and industrial fields. Customers are called on by specially trained representatives equipped with demonstration kits, and in two towns there are model living rooms for demonstrating modern lighting.

The Hydro-Electric Power Commission of Ontario occupies an outstanding position among the great electricity supply authorities of the world, and the magnitude of its operations need not be enlarged upon here beyond stating that it supplies municipalities and rural districts which furnish electricity to more than 462,000 domestic consumers. For many years it was not the policy of the Commission to make any great effort to attract new customers, whether domestic or otherwise, but events of the past six or seven years have brought about a change, and, especially in the domestic field, a great deal has been done from 1933 onwards to increase domestic loads, both by attracting new consumers and by inducing existing ones to use electricity more extensively.

Early in 1933 a campaign was started to increase the number of electric water-heaters in domestic use. Steps were taken to reduce the cost of equipment, and investigations, including laboratory research, were made to find out the best and most reliable types of equipment, while studies were made of heat losses with various thicknesses and kinds of insulating materials. Plans were formulated for supplying complete water-heating equipment, including insulated tank, thermostat and a reasonable amount of piping installed without charge to the consumer. Municipalities, electrical contractors and others interested were supplied with full information regarding the Commission's scheme covering these heaters, and much advertising was done by the municipalities in their local papers and otherwise, the propaganda material being supplied in many instances by the Commission. Booster heaters were also offered on a rental basis. The first type of heater ranges in size from 400 to 2,000 W and booster type from 1,500 to 5,000 W. The Commission has standardised every part of the equipment used in order to bring down the cost as much as possible, but no manufacturer of any part has a monopoly.

Campaign Results

As a result of these efforts, the Commission is now supplying about 32,000 more standard water-heaters and 16,000 more booster heaters, representing a total actual load of about 30,000 horse-power which (owing to the almost 100 per cent. load factor of the standard heaters) is a highly desirable load. As the campaign is still going on this load is likely to be considerably increased. The Commission's policy is to sell power at cost and the rate charged for the standard heaters varies according to the basic cost of power in any particular locality.

Although thousands of electric ranges were already connected to the Commission's lines in 1935, a campaign to add considerably to the number was started in that year, and, as a result of experience gained, a much more intensive one is in full progress now. From April, 1935, to April, 1936, over 7,000 ranges were installed, in spite of the fact that suppliers of gas (natural-gas in some districts and manufactured gas in others) were by no means idle.

The work of the Commission in regard to ranges is, of necessity, somewhat different from that undertaken in connection with water heaters. Advertising, but on a more elaborate scale, follows similar lines. The Commission has prepared a " Manual on Electric Cooking for the Electrical Industry " it issues at irregular intervals, but fairly frequently, a bulletin called " The Hydro Ranger," and it supplies advertising material to municipalities and others.

The Commission has a financing plan for electric ranges which it would take too long to describe here, but which enables consumers to pay for them over periods of from one to five years and is of great assistance to the municipalities in inducing consumers to install them. A special plan has been arranged for rural consumers.

New 3-wire services for domestic consumers are, where necessary, installed free of cost to the consumer. These are what might be called " supply " services, being that portion of the service extending from the overhead lines on the street to the point at which the consumer's service wires emerge from the house.

The Commission is taking part in a scheme for cookery demonstrations by a talking picture; this film is to be shown at over 150 theatres throughout the Province. Some manufacturers are conducting sales schools for dealers and salesmen, and most of them are advertising extensively in newspapers, magazines, &c. It is expected that many more ranges will be sold this year than last.

Indicative of results may be cited the case of Sarnia, a city of 18,000 people, where natural-gas of 1,000 B.th.u. per cu. ft. is sold for 55 cents per 1,000 cu. ft. and the electric range saturation is about 30 per cent. In London, Ont., with a popula-

tion of about 72,000, 475 ranges were sold in a period of fifteen months. Of these the "trade-ins" were about 55 per cent. gas and 35 per cent. electric, the remaining 10 per cent. not being "trade-ins." Thus over 300 additional ranges were connected to the mains. In this city 256 ranges have been put out on trial without any obligation to the consumer; up to a recent date 98 of these had been sold and 98 were still on trial, the remainder having been returned for various reasons, *e.g.*, moving out of town, which, apparently, did not include dissatisfaction with the range.

The Commission has joined forces with the "Better Light—Better Sight" movement which is spreading rapidly throughout Canada and the United States, and as in the case of ranges, has issued a book, which is called a "Plan Book, Better Light—Better Sight Campaign." This sets forth the reasons for lighting campaigns; the need; and the results which may be expected. It also shows how each branch of the lighting industry can co-operate for campaign purposes, there being sections specially addressed to the Hydro-Electric Power Commission; "Hydro" municipalities; manufacturers of, and dealers in, lamps and lighting fixtures; the sales forces of the various bodies interested; and oculists and optometrists. Other portions of the book contain information on "How to Organise Local Campaigns"; "A Lighting Recommendation," based upon minimum requirements for easy and comfortable seeing; and, finally, a considerable amount of advertising material.

Nineteen "schools" have been held in various centres for dealers, salesmen, &c.; demonstrations have been given at local fairs and two exhibitions; and a number of girls have been trained as lecturers and demonstrators. Measures have been taken to reduce the cost of wiring houses and considerable progress has been made in this direction.

A good deal of attention is also being devoted to securing adequate illumination in schools, offices, industrial establishments and other premises, but this work does not come within the scope of the present article.

Cheap Power in Ottawa

It is expected, as a result of efforts made to increase the domestic load, that a considerable number of new domestic consumers will be connected to the Ottawa Electric Company's lines, and that at least 80 per cent. of these will use electric ranges. In Ottawa, electricity for cooking is very cheap, falling as low as one-half cent per kWh. This is due partly to the availability of low-cost power and partly to the fact that not only is there a private company supplying electricity but also a local "Hydro" Commission which obtains electricity from the Hydro-Electric Power Commission of Ontario and sells "at cost."

The company is not actively carrying on a lighting campaign itself, but is co-operating with electrical dealers and contractors by supplying them with literature.

In the area of Montreal, Light, Heat and Power Consolidated electric ranges and water heaters are meeting with a popular reception in the districts beyond territory served by gas where the terms are made sufficiently attractive, as many consumers found it difficult to pay for their ranges on the short-term basis which was formerly in force; this term has now been extended to 48 months.

The lead in lighting seems to have been taken in the Montreal district by the Illuminating Division of the Canadian General Electric Co., which invited representatives of various interested bodies to attend lectures given by their specialists, some of whom came from the General Electric Company in the United States. Later, a branch of the Illuminating Engineering Institute was organised in Montreal, so that increased activity may be expected before long.

Activities in Winnipeg

Winnipeg has a population of about 220,000, but it has cheap hydro-electric power and can lay claim to a high domestic consumption—in 1935 it reached 4,660 kWh per domestic consumer, which is thought to be in excess of any other city in America, if not in the world. The installation of electric ranges and water-heaters is now so general that most of the future sales must be replacements. Present efforts of the Winnipeg Hydro-electric System are devoted to the sale of electric refrigerators. The past six months have been as a time of preparation for the "Better Light—Better Sight" campaign, and it is expected that there will be a busy season this year during the autumn and winter. Arrangements have been made with one of the large Canadian electrical manufacturing companies to hold a School of Lighting to which employés of the System, representatives of electrical firms, optometrists, architects, medical men, building superintendents, &c., will be invited.

The Canadian Hydro-electric Corporation, which has its head office in Ottawa, operates eleven retail stores in various cities and towns in the Province of Quebec. In regard to lighting campaigns, the company depends on the big manufacturing concerns, as these supply a great deal of advertising matter which the Corporation uses in the local newspapers. The same procedure is followed by other electricity supply authorities elsewhere in Canada. The Corporation itself conducts campaigns for the sale of appliances such as electric ranges, water-heaters, refrigerators and washing machines.

The Canadian Electrical Association, which is affiliated with the Edison Electrical Institute in the United States (formerly the National Electric Light Association), has various committees which study and report annually upon various phases of the electrical industry, including, of course, the use of electricity in the home. From some of these reports issued this year the following notes have been compiled.

Air-conditioning

Inquiries made throughout the Dominion indicate that a start has been made in creating a domestic air-conditioning load; at the end of 1935 there were more than 300 residential installations. The average cost was approximately $1,000, but the maximum average cost of three installations was $2,867, while the minimum average cost of two installations of a cheaper type was only $310. The former were designed for operation throughout the year, and thus included means of dehumidifying the air on damp summer days as well as of humidifying it in the winter time when the air in Canadian homes becomes excessively dry due to central heating. The cheaper type was only for winter conditions. The average connected horse-power per installation was about 0.3, the maximum being about 3.25 and the minimum 0.02. These are not very impressive figures, it is true, but the annual, and especially the winter season, load factor is likely to be relatively good. From sources other than the Canadian Electrical Association's reports it is evident that some Canadian firms are beginning to make a definite appeal to householders to install air-conditioning equipment. One of the Toronto daily newspapers recently carried a double page of advertisements of various manufacturers of air-conditioning equipment, interspersed with notes on the advantages of air-conditioning.

While no statistics are given in this year's report in regard to blowers for domestic furnaces, I know that hundreds, if not thousands, of such blowers have been installed during the past few years, and the number is steadily growing. Combined with thermostatic control and the use of cheaper grades of coal they appear to give general satisfaction. Several makes of mechanical stokers for domestic use are now available.

Attention has also been given to other domestic appliances—washing machines, vacuum cleaners, coffee percolators, radio sets, &c. It is considered that although electric laundry appliances have been sold over perhaps a longer period than almost any other domestic types, the market is still a fertile sales field, and the committee reporting on this subject suggests that added to publicity on the advantages of the "all-electric" kitchen attention should now be given to the "all-electric home laundry," which would include, in addition to the washer and the ironer, the water-heater, hot-plate and better lighting.

Water-heater "Saturation"

The C.E.A. reports regarding domestic electric water-heaters that the "saturation" is about 10 per cent. for all Canada, but in some parts it is practically 50 per cent. It is interesting to note the statement that "there are at present nearly 300,000 electric water-heaters installed in the United States and approximately 200,000 in Canada." The saturation in the United States is said to be about 1.3 per cent.

Further comment on this subject is to the effect that while at first water-heaters were installed on the flat-rate system the off-peak rate is becoming more popular. The average flat rate is from $3 to $4 per kW per month; the off-peak rates range from 0.8 cent to 1 cent per kWh in most cases. The following figures relating to all Canada have been supplied by the secretary of the C.E.A.:—

	1935.	1931.
Domestic consumption, kWh ...	1,805,842,000	1,563,704,000
Domestic consumers	1,403,184	1,336,721
Wired homes	1,558,770	1,484,209

Saturation of appliances (per cent.).

	1935.	1931.	1926.
Refrigerators	13.3	7.1	0.2
Ranges	18.1	17.6	11.4
Washers	33.6	26.7	11.3
Water-heaters	10.5	7.2	4.4

The foregoing information, while not exhaustive, will serve to show that, so far as domestic loads are concerned, Canada, at least in the more thickly populated parts, is making a real effort to increase them, with every likelihood of considerable success. It will be interesting to note the progress made during the next two or three years.

The thanks of the author are due to the several supply authorities from whom most of the information given above has been obtained.

Business and Industrial Notes

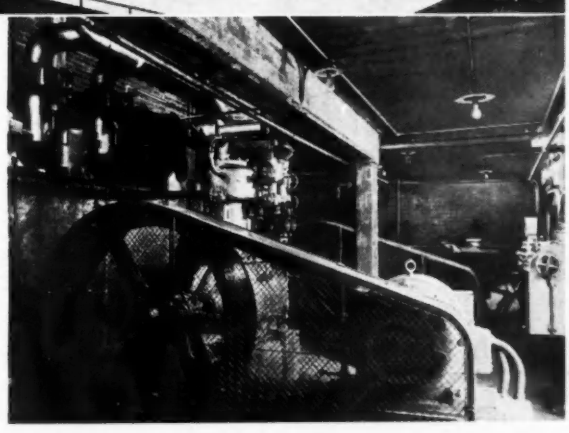
The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

I.C.I. Engineers' Wages

The October *Journal* of the Amalgamated Engineering Union reproduces an agreement arrived at between Imperial Chemical Industries, Ltd., and four engineering unions regarding the rate of payment for a number of classes of engineering workers employed by the company. The agreement, which operates as from September 28th, specifies a standard rate of 1s. 6d. per hour (70s. 6d. per 47-hour week) for fitters, turners, electricians, welders, and other craftsmen. Certain other grades receive specified percentages of this rate—generally lower but in the case of patternmakers and boilermakers the rate is 105 per cent. of the standard. In addition a scale of "merit" bonuses ranging from ¾d. to 3¾d. per hour is instituted; these bonuses will count for overtime computation. It is agreed that no strike or lock-out shall take place "except in pursuance of a dispute in which the company and its employés are directly concerned."

Harringay Sports Stadium

North London's latest sports centre, the £200,000 Harringay Sports Stadium, which was opened last Saturday, has been equipped with electrical apparatus which will enable it to stage practically any indoor game. Up-to-date ice-making plant (York Shipley) will turn the 200 ft. by 90 ft. floor into a skating rink in a quarter of an hour and for the time-keeping in the ice-hockey matches a special electric clock incorporating Smith's motors has been designed by Mr. W. T. Peacock, the chief engineer of the stadium. Beneath this clock is a bank of lighting fittings which can be lowered for boxing contests. Very satisfactory general lighting of the arena is achieved by the use of ten four-lamp reflector-type pendants, while over the spectators' seats have been placed twenty-two box-type fittings, between which is also a number of plain reflector units. In order to guide ticket-holders to their seats the spherical lights in the corridors have appropriate coloured bands round them. Red floodlighting together with neon tubes (Electrolumination, Ltd.) and canopy lights illuminate the front of the building. A ventilating system installed by Messrs. Rosser & Russell, Ltd., keeps the air fresh and at a comfortable temperature. Three "Paramphonic" loud speakers are operated by public address equipment in a room situated under the spectators' seats, while a "Synchromatic" electric clock system has been provided throughout the building. The electricity supply for the building is transformed in the Northmet Co.'s own sub-station on the ground floor from 3,000 V, 3-phase, 50 cycles a.c. to 415/240 V and taken to the main intake chamber directly overhead on the mezzanine floor, whence it passes to four sectional switchrooms, one for each quarter of the stadium. The main switchgear, which has been manufactured by the electrical contractors, Messrs. Drake & Gorham, Ltd., is of particular interest on account of its neatness, compactness and safety features. As a precaution in case of a failure of the main supply a D.P. emergency lighting system is provided, an E.C.C. motor-generator being used for charging the batteries. For the control of the subsidiary circuits Simplex ironclad switch- and fuse-gear is employed very extensively, and practically all the lighting fittings were supplied by the General Electric Co., Ltd. Dr. Oscar Faber was the consulting engineer.



Exterior and interior views of the new Harringay Sports Stadium, together with a section of the ice-making plant comprising a 90-b.h.p. Crompton Parkinson motor driving an ammonia compressor: an Allen West star-delta starter is to be seen on the right

E.D.A. Public Speaking Competition

A booklet describing the organisation of the Public Speaking Competition for the coming winter is now available from the British Electrical Development Association, 2, Savoy Hill, W.C.2. This is the fifth competition which the Association has organised, and each year the number of competitors increases. There are, however, still many who should participate, and those who are interested should apply for a copy of this booklet containing an entry form. The subjects for this year's competition cover three applications of electricity, namely: "The Reliability and Safety of Electricity in the Home"; "Electricity and Modern Building"; and "Electricity for the Gardener."

The B.I.F.

A new booklet has been prepared, of which more than 100,000 copies are printed, called "From a Power Plant to a Powder Puff," illustrating the wide range and contrasts to be found at the British Industries Fair. The booklet, which is published in ten languages and is to be sent to buyers in 110 countries, contains many excellent illustrations showing the wide scope of the Fair.

The Exeter Showrooms

The new showroom of the Exeter City Electricity Department, reference to which was made in our last issue, is entirely heated by direct electric heating equipment of various types, and the total loading of the whole installation is approximately 100 kW. Standard tubular heaters suspended from the ceiling are installed in the basement and special flexible cable connections are used. Radiant heating is obtained from high-temperature panel heaters mounted on the walls of the stores. In various offices "Curlyne" heaters, which are a modified form of tubular heaters with smaller over-all projection from the wall, are used. These heaters are in some cases supplied in double tier, one-piece units which are much less unsightly than double-tier banks of tubular heaters. In other offices the heaters consist of steel plates recessed flush into the skirting boards and the element is supported throughout its entire length in porcelain D section tubes attached to the back of the steel plates. The front plates are painted in heat-resisting enamel together with skirting boards, and the result is an invisible skirting heater which emits radiant heat with low-surface temperature. Owing to restricted skirting board space in the showroom high-temperature panel heaters loaded to 900 W each have been specially adapted and built up in the form of combined light-

ing and heating units. The basic heating of the showroom is, therefore, in the form of radiant heat directed downwards from the lighting, heating units. The complete installation is controlled by "Satchwell" thermostats in conjunction with Reyrolle contactors. The installation was designed by Space Heating, Ltd., and its local agents, the D.C. Electric Co., Ltd., Sherborne, in conjunction with the requirements of the city architect.

A Clacton Cinema

The recently opened Century Cinema, Clacton, designed by Mr. G. H. B. Gould, possesses many outstanding features. An atmosphere of brightness and luxury is achieved in the auditorium by the decorative treatment of the side walls,

G.E.C. concealed lighting in the auditorium of the Century Cinema, Clacton

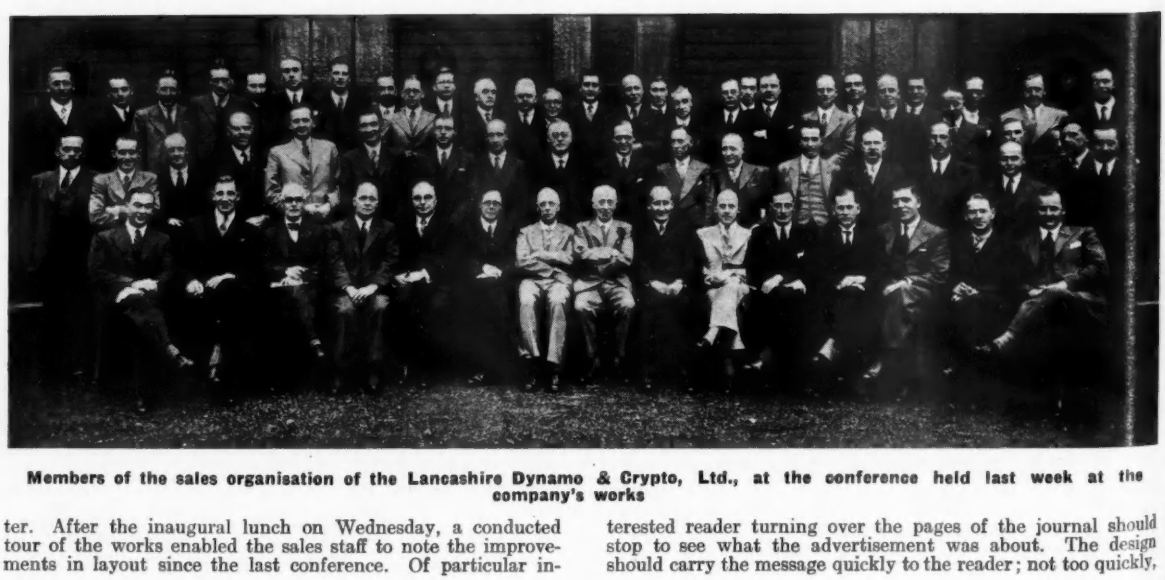
which converge on ornamental grilles each side of the proscenium arch; these grilles are emphasised by means of "Osram" architectural lamps arranged in progressive style to the stage. The main lighting is by "Osram" lamps concealed behind four balcony-to-stage indirect troughs let into the gold plastic ceiling and semi-indirect troughs running behind a frieze around the auditorium. "Genalex" electric clocks to harmonise with the interior decoration are installed throughout the cinema. G.E.C. inter-communication telephones are used throughout the building, and Pirelli-General cables, G.E.C. conduit, and main switchgear and switches have also been used by Messrs. Troughton & Young, Ltd., in the electrical installation work. A striking neon scheme on the exterior of the cinema comprising signs and outlining was supplied by Claude-General Neon Lights, Ltd.

London Transport Wage Increase

The London Passenger Transport Board has granted drivers and conductors of trams and trolley-buses an increase in wages of 2s. per week, with effect from October 1st. The increase is the result of an agreement reached between the Transport Board and the Transport and General Workers' Union.

Lancashire Dynamo Sales Conference

During last week members of the sales organisation of Lancashire Dynamo & Crypto, Ltd., attended a two days' sales conference at the company's Trafford Park Works, Manchester. After the inaugural lunch on Wednesday, a conducted tour of the works enabled the sales staff to note the improvements in layout since the last conference. Of particular interest to the visitors were the large number of special machine tools which have recently been installed to facilitate the rapid handling of the increasing number of important contracts received during the year. In the evening a dinner was held at the Engineers' Club, presided over by Mr. E. L. Chorlton (chairman). A smoking concert followed. Upon the resumption of the conference on Thursday, the various activities of the company, including new products, &c., were described by Mr. H. W. Bosworth (managing director), Mr. C. R. Shaw (director), and members of the technical staff. The accompanying illustration includes the majority of the members who attended the conference, at the conclusion of which all members wished Mr. H. W. Bosworth *bon voyage* for his South African tour for which he sailed on October 9th.



Members of the sales organisation of the Lancashire Dynamo & Crypto, Ltd., at the conference held last week at the company's works

Encouraging the Use of Coal

A deputation from the coal industry, led by Sir Evan Williams, president of the Mining Association, met the Secretary for Mines (Capt. Crookshank) last week to impress upon him the danger of relying upon imported oils and the necessity for encouraging the use of coal and its derivatives as a safeguard against the interruption of overseas supplies of fuel. The deputation, *inter alia*, proposed the establishment of additional plants for the production of oil from coal and the encouragement in times of peace of those forms of road transport which are independent of liquid fuel. It stressed the desirability of replacing trams by electric trolley buses instead of motor buses and of extending the use of the battery-driven electric vehicle.

Irish Free State Electrical Imports

A more active tone prevailed as regards the imports of electrical machinery and allied material into the Irish Free State during August last, a total of £106,491 having been attained as compared with £83,966 in the corresponding month of 1935. The aggregate imports during the eight months ending with August last amounted to £645,739, as against £628,181 in the similar period a year ago, an increase of £17,758. The details of the imports are appended.

	January–August. 1935.	1936.
	£	£
Electric motors	32,569	35,971
Other electric machinery	136,643	151,196
Dry batteries and parts	18,139	11,415
Electric lamp bulbs	45,313	37,250
Electric lighting accessories, fittings and parts	54,949	54,897
Electric wires and cables, insulated	68,431	63,207
Telephone and telegraph apparatus	4,113	12,260
Radio receivers, complete	51,889	42,178
Radio-gramophones, complete	2,440	972
Other radio apparatus, fully, or partly assembled	3,722	5,311
Radio parts and accessories	44,192	50,478
Other electrical goods and apparatus	165,781	180,604
Totals	£628,181	£645,739

As will be seen, various fluctuations have taken place in the trade so far this year, six of the scheduled items showing an increase and an equal number a decrease.

Advertising for Engineers

Speaking before the Yorkshire Branch of the Institution of Mechanical Engineers on the subject of "Advertising in Relation to Engineering Products," at the opening meeting of the 1936-7 Session, held at the Hotel Metropole, Leeds, on October 8th, Lt.-Colonel W. A. Vignoles, D.S.O., M.I.E.E., of Messrs. Evershed & Vignoles, Ltd., stressed the importance of selecting an advertising agent with specialised engineering knowledge. He said that a budget should be made out at the beginning of each year, showing the proposed expenditure on all forms of advertising, and especially the allocation for space advertising. The design of the advertisement required very special study. It should be arresting—a potentially interested reader turning over the pages of the journal should stop to see what the advertisement was about. The design should carry the message quickly to the reader; not too quickly,

however, or it might not be retained. A reader stopping to find out just what the message was, would probably remember longer than if he saw instantly what was intended; this should not, however, be overdone. The advertisement should be up to date in treatment.

Electricity at the Dairy Show

In addition to the many electric sterilising chests, milking machines and cooling appliances which will be on view at the Dairy Show, which is to be held at the Agricultural Hall, Islington, from October 20th to 23rd, an interesting exhibit devoted entirely to electricity and electrical matters is to be staged by the British Electrical Development Association. Practical demonstrations will be given of electric pumping, milk coolers and one of the latest types of electric boiler which has been developed specially for farm use. The value of electric lighting, heating and power in dairy farming will be demonstrated by photographs and particulars taken from farms of all sizes. Information will be obtainable on all applications of electricity and on the cost of electricity supply throughout the country.

Orders Recently Booked

A special microphone control panel and microphone amplifier rack have recently been delivered to the Lithuanian Government broadcasting authorities by the Trix Electrical Co., Ltd. The apparatus consists of a five-channel microphone broadcast control panel with calibrated faders, signal light relays and luminous reflecting type valve voltmeter modulation indicator. The amplifier rack carries main and auxiliary amplifiers, rectifier units and switching panel, the whole equipment being designed for mains operation, with level response from 30 to 10,000 cycles.

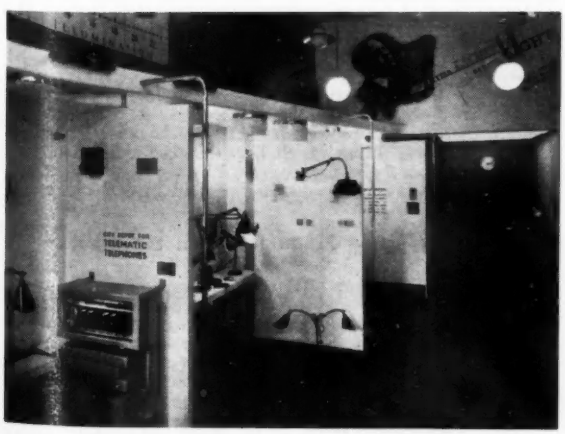
International Combustion, Ltd., has received two repeat orders for "L" stokers, three for the Shropshire, Worcestershire and Staffordshire Electric Power Co. (for the Stourport power station), and three for the Fife Coal Co., Ltd. The stokers for Stourport will be of the twin type, each 26 ft. wide by 21 ft. 6 in. long, giving a grate area of 559 sq. ft. Those for the Fife Coal Co., Ltd., will each be 14 ft. wide by 16 ft. long, giving a grate area of 224 sq. ft. This makes the total "L" stoker grate area sold during the last twelve months over 20,000 sq. ft.

Health Exhibition, Birmingham

The next exhibition of the Royal Sanitary Institute will be held at Birmingham in July, 1937. As in previous years the exhibits will include a number of electrical features such as artificial sunlight apparatus, heating, cooking, lighting and ventilating appliances, refrigerators, and ice-cream machines. The applications for space already received indicate a successful exhibition.

New London Showrooms

To provide a place where executives of business firms and factories can secure expert advice on lighting, heating and other matters, the Mortimer Gall Electrical Centre was opened on Thursday last week at 115-117, Cannon Street, London, E.C.4. Describing its objects, the founder, Mr. J. Mortimer Hawkins, said that, as a result of eleven years' experience as an electrical contractor, he had come to the conclusion that the electrical industry had "stepped off on the wrong foot" in selling electrical equipment as merchandise, whereas what the consumer needed was not electrical fittings but correct lighting or correct heating. The Centre was intended particularly for the commercial field, since the results of incorrect lighting were far more harmful there than in the home. Investigations made it clear that, by spending an amount equal to 2 per cent. of the wages bill on better lighting, output showed an increase equal to 25.8 per cent. of the same wages bill. Electricity provided a means of securing an agreeable and even temperature throughout a building, but we were still not using it correctly. We had yet to make full use of the telephone and its associated facilities, particularly staff location. In opening the centre, Lord Delamere stressed the inadequacy of the average factory lighting and said that there should be a Government inquiry into the matter. A vote of thanks to Lord Delamere was proposed by Mr. H. J. Randall, the secretary and manager of the City of London Electric Lighting Co., Ltd.



A section of the new Mortimer Gall Electrical Centre in Cannon Street, E.C.

The Ideal Homes Exhibition, Norwich

Norwich housewives are beginning to appreciate that electric cookers are an essential part of the modern home, and 10,800 have now been installed as compared with 4,800 in 1931.

The stand of the Norwich Electricity Department at the local Ideal Homes Exhibition

These facts are shown by a chart exhibited at the stand occupied by the Norwich Corporation Electricity Department at the Ideal Homes Exhibition at the Agricultural Hall, Norwich, where there is a comprehensive display of domestic electrical appliances.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted:—

C. Carey, Cardiff.
S. Whitehead, Roby, Liverpool, 14.
L. E. Humphreys, Epsom.
J. Lascelles, Perth.
L. H. Thomas, Portmadoc, N. Wales.
F. O. Brownson, Barton, Beds.

At the same meeting eight applications were declined.

Industrial Photo-cell Control

An installation of "Osram" photo-cell equipment just completed in a Midland factory is another example of the ingenious way in which this apparatus can be used as a means of control in industrial operations. In this instance the equipment governs the feed level of a cocoa nib refining plant. A photo-cell amplifier case is mounted in front of the refiner on a hinged bracket to enable it to be brought up close to the face of the hopper or swung out for inspection. Mounted on the bracket are two similar cases back to back, one containing the photo-cell amplifier and one a time delay circuit. When normally in contact with the side of the hopper, a rubber gasket on the front of the amplifier case comes into contact with the side of the hopper and excludes all stray light from the photo-cell. Light reaches the photo-cell from a 100-W lamp mounted on the other side of the hopper and passes through two slits, one in each side of the wall of the hopper. A conveyor at the top transports the cocoa nibs to the refiner, where they fall into the hopper and down on to the rollers to be broken up. The conveyor, when running at speed, feeds at a considerably greater rate than the consumption of the refiner permits, so that the hopper eventually fills up until the level of the nibs is sufficient to cut off the light reaching the photo-cell. When this occurs, the amplifier relay opens the line contactors, so that the conveyor motor is stopped. The time delay circuit comes into operation when the light is again unobscured and switches the line contactors in again, approximately 2½ minutes after the light level has been passed. By the inclusion of this time delay circuit any tendency of the line contactors to switch in and out in rapid succession is avoided.

The North London Exhibition

At the North London Exhibition held at Alexandra Palace the display of the North Metropolitan Electric Power Supply Co. is always one which has a particular attraction for the public, and the innovation this year of providing a separate Northmet Pavilion allows the various electrical apparatus to

be shown to much better advantage in less cramped and more appropriate surroundings. A huge electric clock surmounts the entrance to the exhibit. Inside, separate sections are devoted to vacuum cleaners, fires, cookers, water heaters, refrigerators, "Electricity in the Garden," television apparatus, lighting and miscellaneous equipment, among which we noticed new snack and buffet servers (Metalcraft Co.) and a new Smith's cigarette lighter. The *pièce de résistance* of the exhibit is, however, a set of model all-electric kitchens constructed and equipped on the most up-to-date lines. Discussing inquiries received, Mr. A. J. Wickens, the Northmet stand manager, told us that there is a big revival in the demand for "figure" lighting fittings and that the refrigerator is now being definitely regarded as an all-the-year-round necessity. Vacuum cleaners figure very prominently in the separate electrical exhibits in the main halls, and are shown by the Tellus Super Vacuum Cleaner, Ltd.; Harles (Hotpoint); New Welbeck, Ltd.; the Hurley Machine Co. (England), Ltd. (which also displays "Thor" washing machines and ironers); C.C.A. (Vacuum Cleaners) Ltd. ("Junior Poliflor" and "Silobeta"); and the British Vacuum Cleaner & Engineering Co., Ltd., whose twenty-four Goblin Girls provide a thrice-daily entertainment in the Concert Hall. Messrs. L. G. Hawkins & Co., Ltd., and Beatty Bros., Ltd., are both featuring home laundry equipment, while radio apparatus is to be seen on the stands of Messrs. A. C. Parker, Ltd.; British Television Supplies, Ltd.; and the Peto-Scott Co., Ltd. The new coloured refrigerators of Zeros (Sales), Ltd., are attracting a good deal of interest. The exhibition closes on October 24th.

U.S. Domestic Electrical Appliance Exports

So far this year there has been a distinct improvement in the overseas demand for American domestic electrical appliances. The appended table shows the exports of such goods from the United States during the six months ended with June last as compared with the corresponding half of 1935, from which it will be seen there was an increase of £494,334, or over 40 per cent.

	Jan.-June. 1935.		1936.	
	No.	Value £.	No.	Value £.
Fans	39,158	40,504	67,404	58,634
Household refrigerators	58,438	919,065	87,305	1,267,155
Washing machines	4,862	46,829	11,429	89,123
Irons	56,039	16,752	72,006	21,617
Cooking ranges	1,485	21,250	4,257	35,203
Other cooking and heating devices ...	67,830	35,616	89,434	51,835
Vacuum cleaners	7,324	22,190	16,834	51,480
Other domestic electrical appliances ...	13,372	38,119	19,369	59,612
Totals	—	£1,140,325	—	£1,634,659

While each item of the table shows an increase, it will be noted that the biggest advance was in respect of refrigerators.

Our Special Domestic Issue

We regret that names and addresses of the following manufacturers mentioned in last week's Special Domestic Issue were accidentally omitted from the list on page 500:—

Callender's Cable and Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.
Chance Bros. & Co., Ltd., Smethwick, Birmingham.
Davies, Kent and Stewart, Ltd., 17, Berners Street, London, W.1.
Drake and Gorham, Ltd., 36, Grosvenor Gardens, London, S.W.1.
Everett, Edgcumbe & Co., Ltd., Colindale Works, Hendon, N.W.19.
Glover, W. T., & Co., Ltd., Trafford Park, Manchester.
Grafton Electric Co., 54, Grafton Street, London, W.1.
Midland Electric Mfg. Co., Ltd., Barford Street, Birmingham.
Rheostatic Co., Ltd., Slough.
Sax, Julius, & Co., Ltd., West Lodge, Lower Mall, Hammersmith, W.6.
Wandsworth Electrical Mfg. Co., Ltd., Kenyon Street, Birmingham, 18.

We are informed that the following companies have changed their addresses to:

Electrona Electrical Products Ltd., Eider House, Piccadilly, Manchester, 1.
Teesmade Ltd., 82, St. Mary's Road, South Ealing, W.5.

Municipal Trading at Marlborough

At a meeting of the Marlborough Corporation on October 5th Ald. J. Duck, chairman of the Electricity Committee, moved that the Committee should be empowered to take steps to increase the use of electricity by the sale or hire of appliances and also to arrange for demonstrations. The proposal aroused considerable discussion, and Councillor T. Pope said that if the motion was carried it would operate against the people who were expected to pay rates. The motion was put to the vote and was carried by eight votes to six.

Price Increase

Messrs. W. T. Henley's Telegraph Works Co., Ltd., announce that owing to a continued increase in the price of raw materials the selling prices of certain rubber-insulated wires and cables have been increased. The increase on taped and braided cables and all armoured cables (not being lead covered) is 5 per cent., on all lead covered and armoured cables 10 per cent., and on all lead covered cables (unarmoured) 15 per cent. Trade discount, rebates, and cash discounts on these cables are unaltered.

An Irish Lighting Service Bureau

The Irish Free State Electricity Supply Board has opened a Lighting Service Bureau in Dublin where, in specially fitted show and lecture rooms, demonstrations will be given to business men, managers and controllers of schools and colleges and others interested in the importance of correct lighting. The Bureau has a staff of specially trained experts, who will give advice and assistance on lighting problems.

Coronation Decorations for Ceylon

Messrs. Roche & Roche (Electrical and Radio Department), P.O. Box 149, Colombo, Ceylon, wish to receive particulars and prices of illumination and decoration equipment for the Coronation.

Syrian Electrical Imports

The total value of imports of electrical machinery into Syria and the Lebanon during 1935 was £580,549, as compared with £334,031 in 1934, according to a report on the economic conditions in Syria and Lebanon prepared by Mr. G. T. Havard, Hon. Consul-General, Beirut, for the Department of Overseas Trade. Of this total, by far the larger proportion came from France with a total of £247,898 (against £128,980), the United Kingdom's share being only £16,944 (against £17,831). Imports of wireless apparatus and accessories totalled £128,552, the United States being the chief supplier with £86,793. Here, again, the United Kingdom's share at £2,735 was very small.

A Scottish Electrical Exhibition

Organised by the Scottish Development Council primarily to stimulate trade in the Special Areas in Scotland, an exhibition of household goods and electrical appliances is to be opened at British Industries House, Marble Arch, London, on October 23rd, by Sir Harry McGowan, chairman of Imperial Chemical Industries, Ltd.

Sunderland Electrical Exhibition

Mr. W. A. Royle, borough electrical engineer, Sunderland, informs us that the attendance at the recent local electrical exhibition, to which reference was made in our last issue, was 79,365. Of this total over 67,000 were admitted by complimentary tickets, which were sent to each house in the area of supply. There was a full house at each of the fourteen cookery demonstrations carried out alternatively by Miss Powell, of the General Electric Co., Ltd., and Mrs. Smith, the senior demonstrator of the Sunderland Corporation Electricity Department. A marionette show proved a great attraction.

Electrical Ironmongers

On Wednesday last Mr. E. B. Holloway, hon. secretary of the Electrical Section of the Ironmongers' Federated Association, gave an address to the West Yorkshire Association at Leeds. His text was "The Position of the Ironmonger Electrical Retailer," and in the course of his remarks he briefly reviewed the "trade politics" of the electrical industry, touching upon the Electrical Development Association and its relations with the Central Electricity Board, the Fair Trading Council and the Electrical Contractors' Association. He resented the suggestion that ironmongers were interlopers in the electrical industry, claiming that they were the first electrical retailers. Some of them did more business than many purely electrical retail establishments. They did not want merely to be asked to sign a fair-trading agreement; they considered themselves entitled to proper representation, as an association, on the Fair Trading Council. He regretted a tendency among some ironmongers to treat electrical goods as a side line. This was an electrical age and they should put electrical equipment in the forefront of their business and encourage their assistants to take advantage of the schemes of electrical training which were being made available. Mr. Holloway finally urged that ironmongers should continue to offer only sound electrical appliances and not be induced to stock cheap and shoddy equipment on account of its low price.

German Radio Industry

The economic group of the German electrical industry announces that the new year of the radio industry, which began with the recent exhibition in Berlin, justifies the hope that the development will be favourable. The advance in the exports of radio apparatus which began in the autumn of 1935 has continued in the current year. The value of the exports in the first half is 38 per cent. higher than in the corresponding period in 1935.

Electric Lamp Manufacture in the I.F.S.

The progress made in the manufacture of electric lamps in the Irish Free State was referred to at the first annual meeting of Solus Teoranta, held in Dublin recently. Mr. J. Walsh, who presided, said that Solus Teoranta was registered on February 23rd, 1935, and although production started only in September of last year their output was now practically sufficient to meet the entire requirements of the Free State in all classes of lamps excepting those used for decoration purposes and a few other small lines. Having established their factory on a rapidly increasing output, they found themselves, like so many other industries, with a market glutted with foreign lamps, imported without a tariff during the period of their industry's preparation. The 75 per cent. tariff which they subsequently enjoyed had undoubtedly a heavily retarding effect on imports from Britain, but, so far as Oriental types were concerned, the effect was infinitesimal. Following approaches made in the early part of the present year to the Government, they had got a quota, but only at a stage when their stocks had reached some hundreds of thousands. Prior to getting that quota their sales were most discouraging, but

they now found themselves, as a result of the restriction of imports and extensive advertising, in the position of enjoying a weekly sale equivalent to about one-half of the total needs of the country. If the demand for their products should progress at the present pace, capacity output should be reached within a month or six weeks. A subsidiary department of their lamp factory was that for making neon signs, which had made a profit and was working satisfactorily. Another subsidiary for the manufacture of bakelite products had not had as much success; in that section there was no tariff in operation, and the country was being flooded with a cheap foreign article.

Social Event

The first dance of the season of the Sports and Social Club of L.E.S. Distributors, Ltd., was held on Wednesday last week at the Victoria Coach Station, S.W., and a large company enjoyed a pleasant evening to the music of Howard's Dance Band.

Prices of Materials

Messrs. Henry Gardner & Co., Ltd., report, October 14th :—No change in the price of copper bars (best selected), sheet and rod. English pig lead, £20, 5s. decrease. Spelter, £14, 3s. 9d. increase. English block tin, £198 10s., £4 5s. increase.

Messrs. Frederick Smith & Co. report, October 14th : Electrolytic copper bars, £45 5s., 15s. increase. Ditto, ditto, wire rods, £49 15s., 15s. increase. Ditto, ditto, h.c. wire, 7$\frac{1}{16}$d., $\frac{1}{16}$d. increase. Silicium bronze wire, 8$\frac{1}{16}$d., $\frac{1}{16}$d. increase.

Messrs. Edward Till & Co. report, October 14th : No change in the price of India rubber, Para fine.

Coronation Displays

"Coronation Display" forms the subject of a lecture by Mr. C. Grey Wornum, one of the committee of three architects appointed to organise London's Coronation decorations, at the opening of the winter session of the National Display Association at the Buyers' Club, British Industries House, Oxford Street, W.1.

Trade Announcement

The Wandleside Cable Works, Ltd., has removed its head office to its works at 106, Garratt Lane, Wandsworth, S.W.18 (telephone : Battersea 2572).

Trade Counter Alterations

The wholesale trade counter at Messrs. Baxter & Caunter's Tottenham Court Road premises has been reconstructed and considerably improved. The actual counter has been lowered to make it more like a shop counter and the storage racks behind it have been replaced by built-in glass-fronted display cabinets each equipped with concealed lighting which the attendant can switch on from the counter. The lighting system has been redesigned and in many other ways the department has been made more attractive to customers.

A Commercial Refrigeration Exhibition

For the special benefit of butchers, fishmongers, caterers, dairymen, brewers, confectioners, &c., the Pressed Steel Co., Ltd., has for the past fortnight been holding a comprehensive exhibition of its "Prestcold" commercial refrigeration equipment at British Industries House, Oxford Street, London. Ten compressors are representative of the company's range, from $\frac{1}{4}$ to 15 h.p.; even the smallest has twin cylinders, while the larger four-cylinder units are of the opposed-V type. Service cabinets for all purposes are available in any size and with either wood or all-steel cases, while ice-cream equipment and beer-coolers are other examples of the company's manufactures. To meet the rapidly growing demand for refrigerated display counters a model has been produced with the compressor unit enclosed inside, and a neat cooler fan is shown for use in restaurants, cellars, &c. A complete milk bar in operation is another feature of the exhibition which closes to-morrow, Saturday.

New Catalogues and Lists

Elexcel, Ltd., Victor Works, Broad Green, Liverpool, 14.—Three catalogues dealing with domestic electrical appliances such as fires, cookers, &c.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, London, W.C.2.—Catalogues of electric clocks, electric lighting fittings of all kinds and electric fires and radiators.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A 64-page booklet dealing with industrial lighting fittings and accessories.

Higgs Motors, Ltd., Witton, Birmingham.—New catalogue sections dealing with gear units, industrial motors, induction motors and fractional h.p. motors.

British National Electrics, Ltd., Newarthill, Mossend, Lanarkshire.—Illustrated details of the new season's electric fires and vacuum cleaners and the "Universal" washing machine.

Franco-British Electrical Co., Ltd., 25, Oxford Street, London, W.1.—A high-quality 52-page coloured catalogue, bound in a stiff cover, dealing with electric illuminated signs of all kinds.

Pickerings, Ltd., Stockton-on-Tees.—A booklet illustrating lift installations.

S. C. Bowker, Ltd., Regent Row, Birmingham, 1.—A complete art catalogue of the company's installation accessories.

K.F.M. Engineering Co., Ltd., 186/188, Shaftesbury Avenue, London, W.C.2.—A brochure illustrating and describing electric signs.

British Aluminium Co., Ltd., Adelaide House, London, E.C.4.—"Aluminium Sections" is the title of the company's latest publication.

Bankruptcy Proceedings

C. J. Mount & Co. (Louisa Mount), electrical dealers, 381, Uxbridge Road, Acton, Middlesex.—This receiving order was made on a creditor's petition and the statement of affairs which has now been filed discloses gross liabilities of £605, of which £603 is expected to rank for dividend, with net assets of £65, leaving a deficiency of £539. The debtor attributes her failure to heavy loss on contracts through delay occasioned by builders, lack of supervision owing to the illness of her husband, and loss of commission paid on orders which were subsequently withdrawn.

F. J. Couchman, 1, High Street, Sturry, wireless and electrical engineer.—This debtor attended at the Guildhall, Canterbury, recently, for his public examination. The statement of affairs submitted showed liabilities of £176, with assets of £49, leaving a deficiency of £127. Debtor said that he realised his position about three months ago. He was questioned regarding hire-purchase transactions, and the examination was closed.

N. Millard, 1, Mercatoria, Saint Leonards-on-Sea, Sussex, wireless, cycle and electrical engineer.—The first meeting of creditors was held on October 8th at the Official Receiver's Offices, 8, Old Steine, Brighton. According to the statement of affairs prepared by debtor there were ranking liabilities of £451, with net assets of £118, leaving a deficiency of £333. Debtor attributed his failure to lack of capital and selling cycles by instalments. The case being a summary one was left in the hands of the Official Receiver as trustee.

J. H. Pasco, carrying on business as J. Danning, 10, New Bridge Street, Truro, wireless engineer.—This debtor attended at the Town Hall, Truro, recently, for his public examination. He said that there had been insufficient turnover to allow him to make a profit. His statement of affairs showed a deficiency of £338. The examination was closed.

G. Warder and **R. Warder** (Warde Richards), radio dealers, 100, George Street, Hull.—Receiving order made October 5th on debtors' own petition.

E. T. Shaw, electrician, 17, Johnstone Road, East Ham.—Application for discharge to be heard on October 27th at Bankruptcy Buildings, Carey Street, W.C.

J. Robertson, electrical engineer, 68, Arran Road, Catford, S.E.—Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C., Official Receiver, released September 25th.

G. F. Kennedy (Kennedy & Co.), electrical engineer, Market Square, Shepton Mallet.—Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver, released August 25th.

J. E. Madden, wireless dealer, 113, Bradford Road, Huddersfield.—Last day for receiving proof for dividend October 20th. Trustee, Mr. G. W. Smith, 23, John William Street, Huddersfield.

J. Newton (Gateshead Electrical & Radio Service), 23, Whitehall Road, Gateshead.—First and final dividend of 1s. 0$\frac{3}{4}$d. in the £, payable October 10th at 81, St. Mary's Place, Newcastle-upon-Tyne.

T. Mehew, electrical engineer and contractor, Victoria Road, Netherfield, Notts.—Receiving order made October 5th on debtor's own petition.

B. Goldenberg (B. Goldie & Co.), dealer in electrical goods, 49, Deansgate, Manchester.—First meeting October 19th at 20, Byrom Street, Manchester. Public examination October 30th at the Court House, Manchester.

W. Sims, electrical engineer, 16, St. James Terrace, Buxton.—First meeting October 16th at 22, Byrom Street, Manchester. Public examination October 30th at the Court House, Stockport.

J. V. Wilson, electrical contractor, 20, High Street, Bromsgrove.—Receiving order made October 3rd on debtor's own petition. First meeting October 20th at 3, Sansome Place, Worcester. Public examination November 3rd at the Guildhall, Worcester.

D. J. Spire, electrical engineer, Market Place, Bourne, Lincs.—Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2, released September 25th.

E. H. Newman and **D. E. Newman** (Newman & Co.), radio and electrical engineers, 17, Shepherd's Bush Green, London.—Last day for receiving proofs for dividend October 24th. Trustee, Mr. S. W. Hood, Bankruptcy Buildings, Carey Street, W.C., Official Receiver.

B. Downing (deceased) (Magneto Service Co.), auto electrical engineer, lately of 51, Grafton Place, Leicester.—Last day for receiving proofs for dividend October 23rd. Trustee, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham.

Company Liquidations

Bodmin Electric Light & Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. R. W. Fryer, Thames House, Millbank, S.W.1. Particulars of claims to the liquidator, by November 17th.

T. B. Watson & Son, Ltd.—Particulars of claims by November 9th to the liquidators, Messrs. A. A. B. Walford and W. J. E. Ringquist, Finkle Chambers, Stockton-on-Tees. This liquidation is for reconstruction purposes, and all admitted debts have been, or will be, paid in full.

Dissolution of Partnership

Electrical Illuminating Co., electrical engineers, 19, Warwick Road, Carlisle.—Messrs. W. W. Ketteridge and J. Morrison have dissolved partnership. Mr. Ketteridge will attend to debts and carry on the business.

Private Arrangement

W. H. Hammond, 18, Church Street, Leamington, radio and electrical dealer.—At a meeting of creditors held recently a statement of affairs was submitted showing liabilities of £980, of which £670 was due to the trade; there were loan creditors for £150, and the balance was due to a partly secured creditor. The assets were estimated to realise £182, from which had to be deducted preferential claims of £26, leaving net assets of £155 and a deficiency of £825. An offer of £200 had been received for the business. The largest creditors, who were not present at the meeting, intimated that they were not prepared to accept a composition of less than 10s. in the £. It was resolved that providing the largest creditors agreed the debtor be called upon to execute a deed of assignment to Mr. F. E. Bendall, of Messrs. Poppleton & Appleby, as trustees.

Electricity Supply

Lighting, Domestic, Power

Australia.—SPECIAL TARIFF FOR AIR-CONDITIONING.—A new tariff introduced by the Sydney County Council applies to air-conditioning apparatus with a minimum aggregate rating of 25 h.p., for which ¾d. per kWh is charged.

Barlaston (Staffs).—STREET LIGHTING.—Estimates for street lighting have been asked for from the Stone Electricity Department and the Stoke-on-Trent Gas Department.

Blackburn.—SODIUM LIGHTING.—Eight lamps of the sodium vapour type have been installed in Montague Street as an experiment.

Cheltenham.—ELECTRICITY FOR HOUSING ESTATES.—The electrical engineer has been asked to obtain tenders for the installation of electricity on the St. Peter's and St. Paul's estates.

EXTENSION TO SEVEN SPRINGS.—Sanction to borrow £2,256 for the extension to Seven Springs has been obtained by the Electricity Committee.

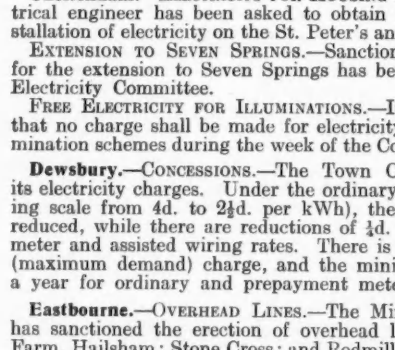
FREE ELECTRICITY FOR ILLUMINATIONS.—It has been decided that no charge shall be made for electricity for approved illumination schemes during the week of the Coronation festivities.

Dewsbury.—CONCESSIONS.—The Town Council has revised its electricity charges. Under the ordinary lighting rate (sliding scale from 4d. to 2½d. per kWh), the quantity at 4d. is reduced, while there are reductions of ¼d. in the prepayment meter and assisted wiring rates. There is also a lower power (maximum demand) charge, and the minimum charge of £1 a year for ordinary and prepayment meters is discontinued.

Eastbourne.—OVERHEAD LINES.—The Minister of Transport has sanctioned the erection of overhead lines at Mullbrooks Farm, Hailsham; Stone Cross; and Rodmill Farm, Eastbourne.

EXTENSIONS.—The following extensions have been approved: To a block of flats in Arundel Road (£300); to King's Drive (£106); to the Lottbridge Drive housing estate (£300); to the Gilda Crescent (Polegate) housing estate (£140); and to Eastdean (£360).

France.—AN ALL-ELECTRIC VILLAGE.—Saint-Hilaire-sur-Helpe, a village in the North of France, has been completely electrified as an experiment. Previously 70 per cent. of the rural users of electricity in this region were doing their cooking by electricity, and this encouraged the authorities to complete the electrification of the district by providing all the equipment needed, such as cookers, water-heaters, kettles, &c. The experiment will last a year, at the end of which users will have the opportunity of retaining the apparatus. The idea is to obtain exact information on the rural consumption of electricity and the opinion of users of the apparatus, which is valued at between four and five thousand francs for each home.



The head office in Threadneedle Street, London, of the Eagle, Star and British Dominions Insurance Co., Ltd., which is being floodlighted each evening throughout the winter

Grantham.—CHANGE-OVER.—The Urban Electric Supply Co. has put in hand a change-over scheme estimated to cost £40,000.

Halifax.—STREET LIGHTING SCHEMES.—Mr. G. A. Vowles, the borough electrical engineer, informs us that the Council has recently approved schemes for the erection of forty-eight electric-discharge lamps from the town centre to the Park Lodge estate, and sixty-five gas-filled lamps (100 to 200 V) on the estate itself. The former scheme will be similar to that which has been in operation in Rochdale Road for a year.

EXTENSION.—Confirmation has also been given to a proposal to extend existing electricity feeders from Cripplegate to Water Lane, at an estimated cost of £2,101.

LOWER FUEL CONSUMPTION.—During September the fuel consumed at the Foundry Street generating station reached the new low record of 1.49 lb. per kWh.

Horsham.—RURAL EXTENSIONS.—A scheme for the linking up of various parts of the rural area in the electricity supply network was approved in principle at a recent meeting of the Urban District Council. The provisional estimate of the cost is £6,549.

Hull.—LOANS.—The Electricity Committee has obtained permission to borrow £15,000 for meters. It is seeking sanction to borrow £50,000 for sub-stations, buildings, and equipment.

EXTENSION.—A supply of electricity is to be provided to Routh at a cost of £1,107.

Jarrow-on-Tyne.—SUB-STATION.—The Town Council has approved plans by the North-Eastern Electric Supply Co., Ltd., for the erection of a sub-station near Primrose Terrace.

Leeds.—NEW EQUIPMENT.—The Electricity Committee has obtained sanction to borrow £24,000 in connection with the extension of the main station switchgear at Kirkstall power station, and £50,000 for the provision of sub-stations and equipment.

Leicester.—PREPARING FOR THE CORONATION.—A sub-committee has recommended the City Council to sanction expenditure up to a penny rate (about £7,500) on the Coronation celebrations and to confirm the appointment of the sub-committee as a special Coronation Committee. It is proposed to undertake extensive floodlighting of the main buildings of the city.

Lincoln.—NEW LIGHTING.—Under the direction of Mr. F. Newey, the city electrical engineer, an important thoroughfare, Ruskin Avenue, has recently been equipped with fifteen "Ediswan Northbury" lanterns and 400-W "Escura" electric-discharge lamps. The "Northbury" lantern embodies a simple reflector system giving full control of the light in both the horizontal and vertical planes.

Middlesbrough.—LIGHTING SCHEME.—The Highways Committee has under consideration a £250 scheme submitted by the borough electrical engineer for lighting the Market Place.

Motherwell.—CHANGE-OVER.—The Corporation has approved a recommendation for the conversion to a.c. of the supply in a number of streets at a cost of £10,124.

Nelson.—LOAN.—The Town Council has authorised an application for sanction to a loan of £7,000 for low-voltage mains and services and sub-station equipment.

Newcastle-under-Lyme.—NEW CABLE.—The Electricity Committee has decided to make application to the Electricity Commissioners for sanction to a loan of £1,600 for the provision of a new feeder cable to the junction of Barracks Road and London Road.

Northern Ireland.—GENERATION OF ELECTRICITY.—An official return shows that 40,901,274 kWh was generated by authorised undertakings in Northern Ireland during the quarter ended September 30th last, as compared with 34,975,143 kWh in the corresponding quarter of 1935, representing an increase of 5,926,131 kWh, or 16.9 per cent. The output during the first nine months of 1936 was 142,361,946 kWh, as compared with 116,308,004 kWh for the corresponding period of 1935, an increase of 26,053,942 kWh, or 22.4 per cent.

North-West Midlands.—ANNUAL ACCOUNTS.—The annual accounts for the year ended March 31st, 1936, have just been issued by the North-West Midlands Joint Electricity Authority. They show an increase in the generation revenue account (under the direction of the C.E.B.) from £139,708 to £157,338, and in distribution from £192,019 to £223,179, the net surplus being £50, as compared with a deficit of £4,820 for the previous year. A total of 120,521,278 kWh was sold (98,101,225 kWh in 1934), and the number of consumers rose from 4,150 to 5,766, thirty-four towns and villages being added to the 1934 total of eighty-five, necessitating an increase in the route length of transmission and distribution line from 247 to 316 miles.

Norton.—RURAL SUPPLIES.—The majority of the tenants of houses owned by the Rural District Council at Ganton, Sherburn and Willerby have intimated their desire for electric lighting facilities, and the Housing Committee has recommended that, consequent upon supplies of electricity being made available, steps shall be taken by the Council to wire the houses for electricity, and that the Buckrose Light & Power Co., Ltd., shall be requested to install a small electric cooker in each house at the company's expense.

Oxford.—ILLUMINATIONS FOR THE CORONATION.—The electrical engineer and manager has been authorised to spend £500 on apparatus for illuminations in connection with the Coronation.

Penarth (Glam.).—ACQUISITION OF ELECTRICITY UNDERTAKING.—The proposed acquisition of the Penarth electricity undertaking by the Cardiff Corporation came under discussion last week at a meeting of the Penarth Council, when it was reported that, subject to the acceptance by the Corporation of a certain proviso regarding the two-part tariff rates, the Council's electricity sub-committee had agreed to the terms offered.

Port Talbot.—PROTEST AGAINST ERECTION OF GENERATING STATION.—The South Wales Electric Power Company has protested against the proposed erection of a generating station by the Town and Factories Development Company. An inquiry into the objection is to be held by the Electricity Commissioners.

Rotherham.—NEW CABLES AND EQUIPMENT.—As it is necessary to augment the cable capacity in the Clifton and Eastwood districts, the Electricity Committee has agreed to lay new cables; these, with reactor and switchgear, will cost £4,800. The feeder to Messrs. Howells' works is to be replaced by a 11,000-V cable at a cost of £4,000. At Swinton sub-station the Electricity Committee is to provide a new rectifier, together with switchgear, cabling, &c., at a cost of £1,900.

CORONATION ARRANGEMENTS.—A sum of £1,500 is to be appropriated from the trading profits of the Electricity and Transport Committees for the Coronation celebrations in the town.

Scarborough.—EXTENSIONS.—Sanction has been received by the Town Council to a loan of £590 for supplying electricity to Staintondale.

Sheffield.—LOANS SANCTIONED.—The Electricity Committee has obtained sanction to borrow £7,980 for buildings at the Blackburn Meadows generating station, £250,325 for plant, and £4,752 for mains (Norton housing estate).

EXTENSIONS.—Mains are to be extended at a cost of £6,371.

Sunderland.—SUCCESS OF ILLUMINATIONS.—The illuminations provided by the Corporation at Roker Park are not only distinctive in themselves, but they are uncommon in that they are a direct source of revenue. This year in three weeks 364,218 people paid to see the illuminations, £8,338 being taken in gate money. Further income was derived from dances and the band enclosure, so that, with the increased takings on the Corporation's transport services, the total income was in the neighbourhood of £12,500, apart from the indirect benefit to local trade. The general opinion of townspeople, expressed through the medium of the Press, is "Well done!" and the Electricity Department (of which Mr. W. A. Royle is engineer and manager) should find this goodwill invaluable in its efforts to secure a further expansion of the use of electricity generally.

South Shields.—LOANS.—The Electricity Committee has obtained permission to borrow £3,000 for meters, and is seeking sanction to a loan of £10,000 for services.

Stalybridge.—INQUIRY.—A Ministry of Transport inquiry was held at Stalybridge last week into the objections of the Bredbury and Romiley Urban District Council against the proposal of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board to erect overhead cables for supplying electricity to Compstall. Mr. J. Harwood Lumsden, chief electrical engineer to the Board, said a recent canvass had resulted in fifty-eight applications being received for a supply of electricity out of 150 premises in the village, which was one and a half miles from the Board's existing supply. It was intended to develop the whole of the rural area, and overhead lines were the only means of providing a suitable supply on sound commercial lines. The objection was on the grounds that the overhead lines would mar the amenities of the district.

Sutton Coldfield.—FURTHER CONCESSION.—The Electricity Committee has considered the tariffs generally and is of opinion that further reductions can be made. It is suggested that under the contract rate the charge per kWh shall be reduced by ½d.

MAINS.—Mains are to be extended at a cost of £854.

A Big Street Lighting Scheme

THE Birmingham Corporation, which recently decided to spend £100,000 on reorganising the lighting system of the city, has placed with the General Electric Co., Ltd., an order for the relighting of 133 miles of streets, chiefly by "Osira" electric-discharge lamps; this is claimed to be the largest order for electric street lighting equipment ever given. At present the system of supply in some parts of Birmingham is in process of being changed over from d.c. to a.c., and in the d.c. areas the lanterns housing the lamps will be so designed that immediately an a.c. supply is available discharge lamps can be used in them. Altogether, nearly 4,000 new lighting units are to be installed. Of these, 1,750 will be equipped with 400-W, 1,370 with 250-W, and 50 with 150-W "Osira" lamps in G.E.C. "Di-fractor" and "Birchfield" lanterns. In addition, some hundreds of 300-W and 500-W "Osram" gas-filled lamps will be used in the d.c. areas. Nearly 3,000 steel columns will be needed, and 970 of the lighting units will be mounted on existing tramway standards. The streets included in the whole scheme comprise nearly one-quarter of the total mileage under the Corporation's control, and nearly every thoroughfare in which the Corporation's transport services operate. The mounting height of the lamps will be 25 ft. Work has already begun in the Bristol Road. This 120-ft. artery, serving the south and west, was one of the earliest double-track roads to be laid. It is between five and six miles in length and has a central section for trams. The whole installation is to be completed in six months under the supervision of Mr. H. J. Manzoni, city engineer and surveyor, and Mr. A. V. Blake, city public lighting engineer. All the lanterns and auxiliaries will be made in the G.E.C. factories in the district.

Todmorden.—CONSUMERS' APPARATUS.—The Electricity Committee is seeking sanction to borrow £20,000 for consumers' electrical apparatus.

NEW PLANT.—A new transformer house with plant is to be provided in connection with a supply to the Cornholme Dye Works.

Torquay.—NEW EQUIPMENT.—Sanction to a loan of £10,000 is being sought by the Electricity Committee for switchgear and transformers.

Tunbridge Wells.—LIGHTING IMPROVEMENTS.—The Corporation is to improve the lighting of Upper Grosvenor Road.

CORONATION PLANS.—Illuminations and decorations for the Coronation at a cost not exceeding £750 are to be carried out by the Corporation.

Wallsend.—UNDERGROUND CABLES.—Plans have been approved by the Town Council for the laying of underground cables on the Bewicke estate by the North-Eastern Electric Supply Co., Ltd.

West Bromwich.—FREE ELECTRICITY FOR THE CORONATION.—The Corporation has agreed to supply electricity without charge for special Coronation lighting.

Indirect lighting at the Paris Motor Show

Winchester.—CONSENT TO EXTENSIONS.—The Rural District Council has consented to the erection of overhead lines at Horton Heath and Fair Oak by the West Hampshire Electricity Co., and at Bursledon and Hamble by the Southampton Corporation Electricity Department.

LOWER CHARGES.—The City Council has adopted the following revised charges: Flat lighting rate, 6d. (formerly 6½d.) per kWh; motive power, sliding scale of 2¾d./2¼d. per kWh instead of a flat rate of 2¾d. per kWh; two-part tariffs for private and business premises, winter "unit" charge reduced by ¼d., making a uniform rate of ¾d. throughout the year. These charges apply to the city area, but corresponding reductions have been made in the rural district rates.

Wolverhampton. — ALTERNATIVE SUPPLY. — The Electricity Committee is to provide an alternative supply to industrial consumers in the Park Village area at an estimated cost of £737.

BULK SUPPLY TO J.E.A.—The Electricity Committee is to seek an order to permit the Corporation to supply electricity in bulk to the North-West Midlands Joint Electricity Authority.

Traction

Derby.—NEW TROLLEY-BUS SERVICE.—Trolley-buses will shortly run on the Osmaston Park Road route. The overhead line has been constructed, and ten new trolley vehicles are being delivered.

Edinburgh.—ELECTRIC SIGNALLING.—Last week-end the largest electric signalling plant yet installed by the L.N.E. Railway Co. was inaugurated at the west end of the Waverley Station. A new feature is the train describing equipment for rapid shunting, designed to expedite operations when arriving trains have to be broken up and remarshalled in a limited time.

Hull.—TROLLEY-BUSES NEXT SPRING.—It is expected that the first trolley-bus service of the Hull Corporation will be inaugurated next April. The route will be from the centre of the city to Chanterlands Avenue North. The next route will serve Newland Avenue.

London.—UNDERGROUND EXTENSION.—The first contract for the new tunnel for the eastern extension of the Central London Underground Railway line has just been placed, and the work of boring a tunnel from Mile End to Leyton—a distance of just over three miles—will start before the end of the month.

Rothesay.—TRAMWAY DISCONTINUED.—The tramway system, which was acquired by the British Electric Traction Co. and electrified in 1902, has been discontinued. Recently the undertaking was acquired by the S.M.T., and the district is now being served wholly by motor buses.

Sweden.—GOTHENBURG-MALMÖ RAILWAY ELECTRIFICATION COMPLETED.—The electrification of the whole State Railway line between Gothenburg and Malmö has now been completed, work on the stretch between Halmstad and Gothenburg having just been finished, learns *Reuter's Trade Service* from Stockholm. The length of the line between Malmö and Gothenburg thus incorporated in the electrified State railway system is 299 km.

Communications

Great Britain.—TELEVISION.—The B.B.C. regular television service will begin on November 2nd. It will be opened by the Postmaster-General, and the ceremony at Alexandra Palace will be televised. Regular programmes will thereafter be given twice a day, from 3.0 to 4.0 p.m. and from 9.0 to 10.0 p.m., except on Sundays. The choice of transmitting system to be used at the opening was decided by the toss of a coin, which resulted in favour of the Baird method.

RADIO LICENCES.—During September, 523,055 radio licences were issued, a net increase of 45,295 over the previous month.

India.—TELEPHONY.—*The Times* reports that a telephone service from Katmandu, in Nepal, to Sirah, 177 miles away, was opened last week.

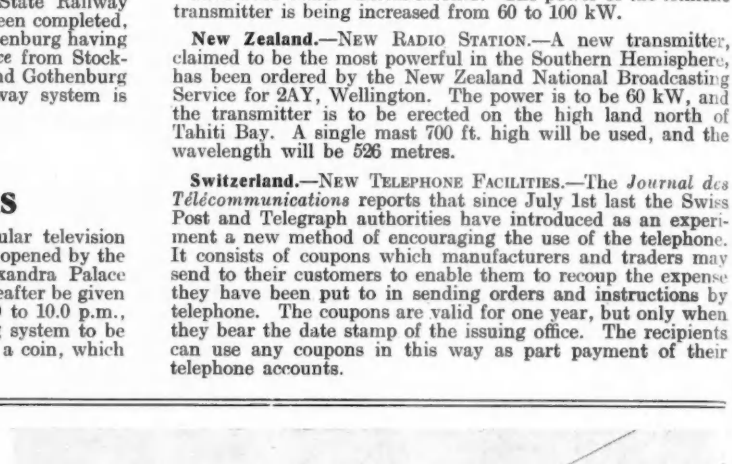
Irish Free State.—BROADCASTING.—The power of the Athlone transmitter is being increased from 60 to 100 kW.

New Zealand.—NEW RADIO STATION.—A new transmitter, claimed to be the most powerful in the Southern Hemisphere, has been ordered by the New Zealand National Broadcasting Service for 2AY, Wellington. The power is to be 60 kW, and the transmitter is to be erected on the high land north of Tahiti Bay. A single mast 700 ft. high will be used, and the wavelength will be 526 metres.

Switzerland.—NEW TELEPHONE FACILITIES.—The *Journal des Télécommunications* reports that since July 1st last the Swiss Post and Telegraph authorities have introduced as an experiment a new method of encouraging the use of the telephone. It consists of coupons which manufacturers and traders may send to their customers to enable them to recoup the expense they have been put to in sending orders and instructions by telephone. The coupons are valid for one year, but only when they bear the date stamp of the issuing office. The recipients can use any coupons in this way as part payment of their telephone accounts.

Italian Railway Electrification

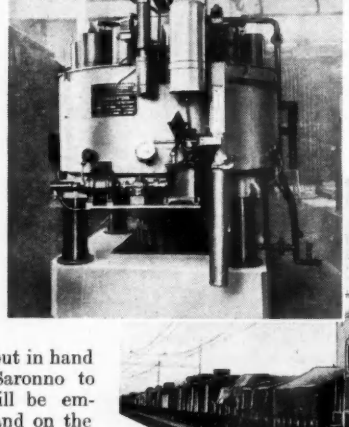
THE decision of the Italian Government to make an allowance of 1,200,000,000 lire for the electrification of further State-owned railways in the six fiscal years commencing 1937/1938 is announced at a time when the work of electrifying a number of lines is approaching completion. On October 28th electric traction will be introduced on the lines from Cervignano to Monfalcone (17 km.), Trieste to Monfalcone, Gorizia and Udine (83 km.), Bivio d'Aurisina to Aurisina, San Pietro del Carso and Postumia (68 km.), Trieste to Aurisina (17 km.), and San Pietro del Carso to Fiume (60 km.). The Cervigano to Monfalcone, Trieste, Aurisina and Postumia line is a section of the Simplon-Orient route, and international trains also run between Trieste and Vienna. Electrification will shorten the journey between Trieste and Postumia by nearly half-an-hour.



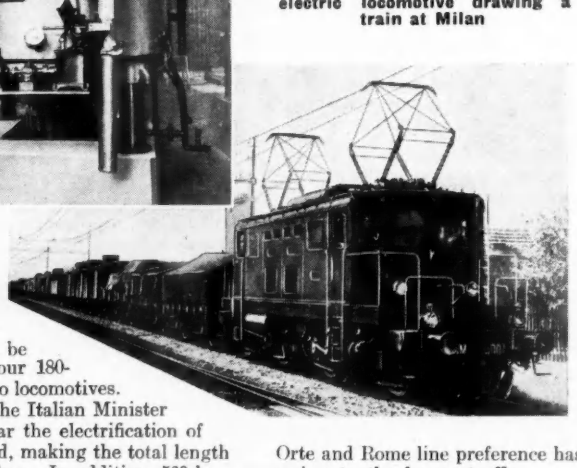
Part of the privately owned Bribano to Agordo railway, showing a pole carrying contact wire and circuit-breaker device

The electrification of these lines has involved an expenditure of 200 million lire. Four convertor stations have been built at Redipuglia, Trieste, San Pietro del Carso, and Abbazia Mattuglie. The supply is received at 60,000 V and operation is at 3,000 V d.c.

The locomotives to be used on the newly electrified routes have six traction motors totalling 2,000 h.p.; they will be capable of a maximum speed of 95 kilometres per hour.



Type of mercury-vapour arc rectifier employed by the Italian State Railways, and (right) an electric locomotive drawing a train at Milan



Apart from the State Railway system, the lines of certain private concerns are also being electrified. The Compagnia Generale di Elettricità of Milan has started the electrification of the Bologna to Vignola railway, while the Società Anonima Ferrovie Nord Milano has put in hand the conversion of the Saronno to Como route. D.c. will be employed on these lines, and on the Saronno to Como line two mercury-vapour arc rectifier stations are to be provided. Electric rail-cars with four 180-h.p. motors will be used in addition to locomotives. According to a recent statement of the Italian Minister for Communications, during this year the electrification of 230 km. of railways will be completed, making the total length of the electrified lines in Italy 3,400 km. In addition, 560 km. of route, including the Salerno to Reggio Calabria railway, will be electrified during 1937, while preliminary works have been carried out in connection with the electrification of a further 1,100 km. of route, including the lines from Rome to Leghorn, Ancona to Bologna and Milan, Orte to Falconara, and Milan to Voghera, and contracts have been placed for convertor stations.

Lately the question of improving the railways owned by the Società Veneta per Ferrovie Secondarie at Padua has been under consideration, but it has been undecided whether to electrify the lines or to use Diesel traction. This is a problem which is attracting the attention of the Italian railway experts at the present time.

On September 21st a combined Diesel rail-car and boat service was instituted between Rome and Cagliari, Sardinia, the time taken being thereby reduced by more than two hours. It should be noted that the Italian State Railways have considerable hydro-electric resources at their disposal in Sardinia, and a coal mine at Bacu Abis. On the Ancona to Orte and Rome line preference has been given to electrification owing to the heavy traffic.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—October 20th. County Council. Electric wiring of police station at Lonmay. A. H. L. MacKinnon, 245, Union Street.

Barking.—October 27th. Electricity Department. E.h.v. switchgear. (See this issue.)

Blackpool.—October 22nd. Fylde Water Board. Two electrically driven, centrifugal pumps and switchgear for the Barnacre filter house, near Garstang. G. F. Atkinson, engineer, Sefton Street (deposit £2 2s.).

Bradford.—October 29th. Transport Committee. Various stores, including electrical fittings for vehicles, insulating material, wire, copper controller contacts and electrodes, for twelve months from January 1st next. Transport general manager, 11, Forster Square.

Cannock.—October 24th. U.D.C. Electricity Department. Two 3-panel, 3-phase, 6,600-V, truck-type switchboards. (October 9th.)

Dewsbury.—October 21st. Joint Hospital Board. Electric wiring of new buildings and extensions and rewiring of existing buildings at the Mitchell Laithes Fever Hospital, Earlsheaton. Borough electrical engineer, Bradford Road.

Dunmow.—November 9th. R.D.C. Duplicate sets of electrically driven, centrifugal, bore-hole pumps, with appurtenant appliances, for the proposed Thaxted pumping station. E. Sandeman, consulting engineer, E. Sandeman & Partners, 15, Victoria Street, London, S.W.1 (deposit £3 3s.).

Eastbourne.—October 30th. Electricity Committee. Open type, semi-enclosed and totally enclosed lanterns, lamps and complete equipment for sodium-type street lighting. (See this issue.)

East Riding.—Education Committee. Electric lighting and heating apparatus at the new Council school, Willerby Carr Lane (320 scholars). County architect, County Hall, Beverley (deposit £3 3s. in each case), by October 28th.

Edinburgh.—November 4th. City Council. One motor-driven circulating water pump with valves, expansion pieces and two chain-grate mechanical stokers to be fitted to existing boilers at the Portobello power station. (See this issue.)

Erith.—October 19th. U.D.C. Electricity Department. Tubular heaters and thermostats, water heaters, cooker and inset fires for the bulk supply station, Walnut Tree Road. (October 9th.)

Harrogate.—November 14th. Electricity Committee. Three 750-kVA, oil-cooled, outdoor type transformers, and one seven-panel, 150,000-kVA switchboard. (See this issue.)

Horsham.—October 27th. R.D.C. Electrically driven air compressor and one and/or two electrically driven centrifugal booster pumps, complete with automatic control gear, for the Crawley water works. Council's water engineer, Council Offices, Storrington, Sussex (deposit £2 2s.).

Irish Free State.—December 15th. Electricity Supply Board. 110,000-V transmission line between Dublin and Dundalk. (See this issue.)

Lanark.—County Council. Electrical installation at police station and houses at Harthill. J. Stewart, County architect, Motherwell, by October 19th.

Leeds.—October 26th. Housing Committee. Electric wiring on the Gipton housing estate (Area No. 4), consisting of (Contract No. 27E): 134 houses and cottage flats on section No. 1. (Contract No. 28E); 378 houses and cottage flats on section No. 2. (Contract No. 29E): 184 houses and cottage flats on section No. 3. R. A. H. Livett, housing director, 26, Great George Street (deposit £2 2s. for each contract).

Liverpool.—October 28th. Water Committee. Electric lighting at premises in Green Lane, Dudlow Lane and Pall Mall, Liverpool, and at Prescot. Water Engineer's Office, 55, Dale Street (deposit £2 2s.).

Lochgelly (FIFE).—October 24th. Town Council. Electric lighting of fifty-two houses. J. Gentles & Son, Central Chambers, Kirkcaldy (deposit £1 1s.).

London.—POPLAR.—November 9th. Borough Council. Engineering work in connection with the proposed heating, hot and cold water, fire services, and electrical thermal storage equipment, &c., for the new Town Hall. Town clerk, Town Hall (deposit £3 3s.) by October 20th.

Manchester.—October 29th. Electricity Department. 33-kV and 6.6-kV, 3-phase, a.c. switchgear at Dickinson Street substation; four 660-V, d.c. switchboards at various sub-stations; and 420-V, 3-phase, a.c. switchgear at the Barton-upon-Irwell power station. (October 2nd.)

October 30th. H.p. steam and water valves for the Barton power station. (See this issue.)

October 21st. One heavy duty, motor-driven lathe for the Polygon Works, Ardwick. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall.

October 28th. Waterworks Committee. 4,300-yd. of e.h.v., p.i., l.c. and steel tape armoured cable. (See this issue.)

Portsmouth.—November 3rd. Electricity undertaking. Circulating water pumping plant. (October 9th.)

Salford.—October 20th. City Council. 5,000-yd. of l.v. four-core, p.i., l.c. cable. (October 9th.)

Shoreham-by-Sea—October 19th. U.D.C. Alternative tenders for lighting Parkside Street, Kingston-by-Sea, by electricity or gas. J. Dunn, surveyor, Town Hall.

Sleaford.—October 19th. U.D.C. Electricity Department. One steel kiosk; e.h.v. and l.v. switchgear. (October 2nd.)

South Africa.—November 27th. Public Works Department. Two transformers and h.v. switchgear. (T.Y. 30849.)*

PRETORIA.—November 6th. Union Tender and Supplies Board. Telegraph and telephone line material. (T. 30856.)*

PORT ELIZABETH.—November 12th. Municipality. Transformers, kiosks, cables, switchgear, street lighting fittings, lamps, &c. (T.Y. 30859.)*

CAPE TOWN.—December 18th. Cape Hospital Board. X-ray equipment at the Groote Schuur Hospital. (See this issue.)

Stockton-on-Tees.—October 23rd. Borough Council. 11,000-V, three-phase and l.v. sub-station switchgear; two 750-kVA indoor transformers; five kiosks complete with transformers and switchgear; and one 200-kVA outdoor transformer. (October 9th.)

Walsall.—November 2nd. Electric Supply Committee. Electricity supply equipment and domestic apparatus for one year. (See this issue.)

West Riding.—October 26th. County Council. Electric lighting and l.p. hot-water apparatus at Oakworth new junior mixed and infants' school. Education officer, County Hall, Wakefield.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Barrow-in-Furness.—Electricity Committee. Accepted. Fire protection plant for the Buccleuch Street works (£1,318).—Mather & Platt, Ltd.

Recommended. Switchgear and rectifier equipment (£4,230).—Electric Construction Co.

Birmingham.—Health Committee. Accepted. Electrical installation at Dudley Road Maternity Hospital.—T. Clarke & Co.

Water Committee. Accepted. Electrical pumping plant at King's Vale pumping station.—Pulsometer Engineering Co.

Salvage Committee. Accepted. Nine electric vehicles.—Electricars, Ltd.

Blackpool.—Electricity Committee. Accepted. Transformers.—B.T.H.; English Electric Co.; Lindley Thompson Transformer and Service Co.

Bradford.—Electricity Committee. Accepted. Reconditioning lift at the power station.—Reliance Lift & Engineering Co.

Canterbury.—City Council. Accepted. Electrical heating plant for the new baths (£1,731).—A. Reyrolle & Co.

Isle of Wight.—County Council. Electrical equipment at new County Offices, Newport (£2,310).—Grierson, Ltd.

Lanark.—County Council. Accepted. Electric lighting in 450 houses at Bellshill (£2,596).—W. Clyde.

London.—L.C.C. Wiring and fittings for electric lighting, &c., in blocks 7 (part), 8 and 11 of dwellings on the Browning estate (King and Queen Street area), Southwark:

	£		£
Jacob White & Co. Accepted ...	939	F. G. Edey & Co.	1,046
A. Hawkins & Sons	958	G. E. Thomas & Co.	1,064
S. Reed & Sons	992	Read & Partners, Ltd.	1,081
Coleby & Co.	992	Smith & Hammond, Ltd. ...	1,401
F. Angell & Co.	1,010	Higgs & Hill, Ltd.	1,780
Caine Parnot, Ltd.	1,037		

Wiring and fittings for electric lighting, &c., in blocks 2, 3 and 4 of dwellings in the Haggerston Road area, Shoreditch:

	£		£
J. L. Shadwell. Accepted ...	956	Basinghall Electric Co.	1,127
W. H. Gaze & Sons	1,030	F. G. Edey & Co.	1,178
A. Hawkins & Sons	1,075	Francis Polden & Co.	1,197
C. J. Ferguson & Sons	1,103	A. E. Mayhew & Co.	1,238
Grant & Blake, Ltd.	1,119	E. Beckwith & Co.	1,560
S. Reed & Sons	1,123		

Electrical installation in new Nurses' Home, Darenth Training Colony:

	£		£
Read & Partners, Ltd. Accepted	954	Buchanan & Curwen, Ltd. ...	1,260
A. Cozens	1,021	A. Meckhonik	1,265
A. Hawkins & Sons	1,185	T. Clarke & Co.	1,287
Francis Polden & Co.	1,239	Berkeley Engineering Co. ...	1,298
S. Reed & Sons	1,250	J. H. Plant, Ltd.	1,320

Electric bed lift in the new ward block, Paddington Hospital:

	£		£
Pickerings, Ltd. Accepted ...	673	Marryat & Scott, Ltd.	1,095
Waygood-Otis, Ltd.	1,014	Express Lift Co.	1,198
J. & E. Hall, Ltd.	1,075		

Wiring and fittings for electric lighting, power, clocks, telephones, fire alarm and domestic call bell systems in the new Nurses' Home, St. Faith's Hospital, Brentwood:

	£		£
Read & Partners, Ltd. Accepted	791	Francis Polden & Co.	895
Gillham & Jones	819	B. French, Ltd.	910
A. Hawkins & Sons	824	A. Meckhonik	935
J. L. Shadwell	850	A. J. Hewens & Sons	948
Pinching & Walton	855	W. J. Furse & Co.	1,079
S. Reed & Sons	858	G. E. Thomas & Co.	1,123
Electrical Installations, Ltd. ...	883	D. Myer & Co.	1,200

Automatic telephone equipment and cores for a fire-alarm system at the Newington Institution:

	£		£
A. Hawkins & Sons. Accepted ...	1,029	Francis Polden & Co.	1,137
Read & Partners, Ltd.	1,044	Automatic Electric Co.	1,145
Electrical Installations, Ltd. ...	1,081	Reliance Telephone Co.	1,156
Ericsson Telephones, Ltd. ...	1,088	T. Clarke & Co.	1,170
Standard Telephones	1,120	H. J. Cash & Co.	1,174
Pinching & Walton	1,122	Buchanan & Curwen, Ltd. ...	1,237

Wiring and fittings for electric lighting, heating and power at the Cubitt Town school:

	£		£
F. Angell & Co. Accepted ...	**1,257**	Francis Polden & Co.	1,673
Grant & Blake, Ltd.	1,305	Electrical Installations, Ltd. ...	1,693
Higgs & Hill, Ltd.	1,475	Ellis & Ward, Ltd.	1,749
Collins Electrical, Ltd.	1,573	B. French, Ltd. ... Tender incomplete	

Manchester.—Town Hall Committee. Accepted. Automatic vote-recording system at Council Chamber.—Reliance Telephone Co.

Electricity Committee. Accepted. Cables, &c.—Standard Telephones. Boiler feed pump at the Stuart Street power station.—Mather & Platt, Ltd.

Transport Committee. Accepted. Trolley-bus chassis, with Met.-Vick. electrical equipment.—Leyland Motors, Ltd. (twenty-one); Crossley Motors, Ltd. (twenty-two).

Motherwell.—Town Council. Accepted. Electric lighting at 402 houses to be erected on the Golf Course estate (£4,058).—J. Shaw & Son.

Rotherham.—Transport Committee. Recommended. Electrical installation at new transport depôt.—Dean's Electrical & Engineering Co.

Sleaford.—Electricity Committee. Accepted. Materials for the Southgate change-over: L.v. underground mains and distribution material, joint boxes and tape.—Callender's. Iron-clad service cut-outs.—Lucy & Co. Compound.—Bitulac, Ltd. Meter boards.—B.I. Cables, Ltd.

Todmorden.—Electricity Committee. Accepted. Cable from Millwood to Meadow Lane (£625).—W. T. Glover & Co. Condenser (£302).—Johnson & Phillips, Ltd.

Tottenham.—Baths Committee. Recommended. Electric motor and piping for bath filtration plant (£124).—Worthington Simpson, Ltd.

Highways Committee. Recommended. Traffic signals at West Green Road (£355) and at Green Lanes (£571).—Siemens & General Electric Railway Signal Co.

Wakefield.—Housing Committee. Accepted. Wiring fifty houses on the Eastmoor estate.—H. Goodyear.

Weymouth.—Town Council. Accepted. Electric lighting at 140 houses at the Goldcroft estate (£1,400).—Bennett & Escott.

Worthing.—Highways Committee. Accepted. Street-lighting equipment (£372).—Brighton Lighting and Electrical Engineering Co.

Electricity Committee. Accepted. Transformers, h.v. switchgear and supervisory control gear (£3,493).—G.E.C. Three transformer kiosk sub-stations and one spare transformer (£1,466).—W. Lucy & Co.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, October 22nd. Institution, London, W.C.2. 6 p.m. Inaugural address by Mr. H. T. Young.

South Midland Students' Section.—Saturday, October 17th. 3 p.m. Visit to the works of the British Thomson-Houston Co., Rugby.

Mersey and North Wales (Liverpool) Centre.—Monday, October 19th. The University, Liverpool. 7 p.m. Chairman's address by Mr. F. E. Spencer.

North Western Centre.—Tuesday, October 20th. Engineers' Club, Albert Square, Manchester. 7.30 p.m. Chairman's address by Mr. G. L. Porter.

Tees-side Sub-Centre.—Tuesday, October 20th. Cleveland Technical Institute, Middlesbrough. 6.45 p.m. Chairman's address by Mr. W. S. Ramsdale.

Sheffield Sub-Centre.—Wednesday, October 21st. Royal Victoria Hotel, Sheffield. 7.30 p.m. Chairman's address by Mr. A. R. Chaytor.

Association of Supervising Electrical Engineers.—Friday, October 16th. College of Technology, Leeds. 7.15 p.m. "Electric Discharge Lamps." Mr. W. Rule. Tuesday, October 20th. E.L.M.A. Lighting Service Bureau, London, W.C.2. 7.15 p.m. Presidential address by Mr. H. Hobson. Saturday, October 24th. Hotel Russell, London, W.C.2. 6.30 p.m. Dinner and dance.

Birmingham Electric Club.—Friday, October 16th. Grand Hotel, Birmingham. 7.15 p.m. Annual ladies' evening.

Institute of Transport.—Tuesday, October 20th. Institution of Electrical Engineers, London, W.C.2. 5.30 for 6 p.m. "Road Transport Statistics." Mr. A. E. Kirkus.

Edinburgh Electrical Society.—Wednesday, October 21st. Philosophical Institute, Edinburgh. 8 p.m. "Electrical Discharge Lamps and their Uses." Mr. L. J. Davies.

Institution of Engineers-in-Charge.—Wednesday, October 21st. E.L.M.A. Lighting Service Bureau, London, W.C.2. "Progress in Electric Lamps and Lighting, with special Reference to the Discharge Lamp." Mr. W. J. Jones.

Institute of Wireless Technology (*London and Home Counties Section*).—Thursday, October 22nd. Institute, London, S.W.1. "Ultra Short Waves, their Advantages, Applications and Limitations." Mr. M. G. Scroggie.

Institution of Mechanical Engineers.—Thursday, October 22nd. Grosvenor House, London. W.1. 6.45 for 7.15 p.m. Annual dinner. Friday, October 23rd. Institution, London, S.W.1. 6 p.m. Presidential address by Sir Nigel Gresley.

Junior Institution of Engineers.—Friday, October 23rd. 39, Victoria Street, London, S.W.1. 7.30 p.m. "The Elements of Pumping Machinery." Mr. B. J. Lymer.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, October 23rd. Institution, Newcastle-upon-Tyne. Presidential address by Prof. C. J. Hawkes.

Conference of the Smaller Electricity Undertakings.—Friday, October 23rd. Institution of Electrical Engineers, London, W.C.2. 2.30 p.m. To consider the McGowan Committee's report.

Notes

New Electric Discharge Lamps

At a meeting of the Association of Supervising Electrical Engineers at Manchester on Tuesday Mr. W. Rule presented a paper on "Electric Discharge Lamps." After dealing comprehensively with the physical principles of the mercury type and the characteristics of the 150-, 250- and 400-W lamps now in use to the number of 15,000 on 500 miles of traffic routes in this country, he discussed the 80- and 125-W ratings which are to be introduced shortly for mains voltages of from 200 to 260 V. These lamps will have quartz tubes instead of borosilicate glass, and the gas pressure will be about ten atm. instead of one atm. Comparing the 125-W size with an existing 150-W lamp, the distance of separation of the electrodes of the former is 3 cm. against 9 cm., giving wattage dissipation per cm. of arc length of 40 against 17; its spectrum has twice as much red content. Lamp voltage drop is about the same. The 125-W lamp has a light centre length of 120 mm., an average current of 1.2 A, a typical lamp voltage of 130 and an initial luminous efficiency of 40 lumens per watt; for the 80-W size the figures become 100 mm., 0.8 A, 125-V and 38 lumens per watt. Mention was also made of a special lamp that had been developed for the examination of rotating parts of machinery. By a simple modification of circuit within the lamp, operation of the existing range of lamps on mains voltages of from 100- to 130-V has been made possible. One of the leads of the main electrode near the auxiliary electrode is connected to one side of the mains and the second to the other side of the mains through a thermal switch. On closing the circuit a current, of a value determined by the series choke, is passed through the electrode and raises the temperature of its thermionic material, causing an emission of electrons. Heat is conducted to the thermal switch which opens in a minute or two, when the mains voltage is applied between the main electrodes and the discharge is started. Afterwards the lamp behaves in the same way as a 200-260-V lamp.

Mining Electrical Engineers

The first meeting of the session of the Association of Mining Electrical Engineers, South Wales Branch, was held at Cardiff on October 10th. At the outset the retiring branch president, Mr. H. Williams, occupied the chair. A special prize valued one guinea was presented to Mr. G. A. Cowles for a paper on "Some Comparisons in Mine Shaft Signalling." Mr. Sidney B. Haslam, the new president, dealt in his address with the mining electrical man of yesterday, to-day and to-morrow. He said it was not until the early part of the present century that colliery owners realised the true value of electricity and that it would be necessary to overhaul their personnel.

I.E.E. Meter Section

The annual dinner of the Meter and Instrument Section of the Institution of Electrical Engineers is to take place on November 13th (morning dress only) and will be followed by an informal concert and reunion. The president, Mr. H. T. Young, will be the guest of the evening. The need for increased accommodation has resulted in a move to the Holborn Restaurant, involving a slightly increased charge (8s. 6d. each, exclusive of wines). The section has issued a book of rules and list of membership which now totals 641—129 full members and 318 associate members.

Papers for Electrical Purposes

The range of B.S. Specifications for electrical insulating materials has been extended by the publication of one for papers (unvarnished), which indicates broad classifications and typical thicknesses; the limits included in the specification apply only to the thicknesses of paper which are given in the tables included. Copies of the specification (B.S.S. No. 698-1936) may be obtained from the British Standards Institution, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

Appointments Vacant

Showroom manager for the Aldershot Electricity Department.

Meter reader for Reigate Corporation.

Temporary assistant sub-station attendants for Weymouth and Melcombe Regis Electricity Department.

Lady demonstrator for Eastbourne Electricity Department.

Male showroom assistant for Exeter Electricity Department.

Mains foreman for Bombay Electric Supply & Tramways Co., Ltd.

(See our classified advertisements.)

Our Service Department

EVERY day enquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

Electric paint scorching lamp.

Whistling kettle incorporating automatic safety device.

CORY coffee percolator.

Readers should enclose stamped addressed envelopes when making their enquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. Pakenham Beatty, who has acted as consultant for the electrical plant and equipment of the Pinewood Studios, which are described on page 523 of this issue, was educated at University College, London, and served his apprenticeship with Edmundson's Electricity Corporation and the Underground Electric Railways of London. From 1907 to 1912 he was resident engineer and manager of the South American Light & Power Co., in Argentina, and during the following three years was chief engineer to the Buenos Aires Lacroze Tramways. During 1916-1917 he acted as chief engineer to the Buenos Aires Subway of the Anglo-Argentine Tramway Co., on the reorganisation of the line after the dismissal of the German staff, and from 1917-1919 he served in the R.N.V.R. and in the A.I.D. During 1919-20 he assisted in the taking over by the British Government from the German owners of a large electricity supply and traction undertaking in South America. For the following three years he was special representative in Spain of the Westinghouse Electric International Co., and in 1923 he was appointed chief electrical engineer of

Mr. Pakenham Beatty **Mr. F. V. Hauser**

the newly formed Contracting and Hydro-electric Department of Sir W. G. Armstrong, Whitworth & Co., Ltd. He left that company in 1927 to take up the position of chief engineer to the Bombay Electric Supply & Tramways Co., Ltd., but returned to England two years later, and has since been in private practice.

Mr. F. V. Hauser, engineer to Pinewood Studios, Ltd., was educated at Bath Grammar School, and was pupil to Mr. F. Teague, then city electrical engineer, of Bath, and was with the Bath Corporation for four years. He left there to join Messrs. W. J. Furse & Co., Ltd., Nottingham, with whom he was engaged on installation work for four years, following which he was associated with the Provincial Cinematograph Theatres, Ltd., as travelling electrician, and the London Film Co., Ltd., as engineer in charge at St. Margaret's, Twickenham. For a short period he was engineer in charge to the Alliance Film Corporation, and in April, 1920, he was appointed engineer to the Stoll Picture Productions, Ltd., Cricklewood, a position which he held until August last, when he took up his present position with Pinewood Studios, Ltd.

Mr. H. C. Lamb and **Mr. C. D. Taite** are representing the Institution of Electrical Engineers, and **Mr. J. W. J. Townley** the Incorporated Municipal Electrical Association, at the annual conference of the National Smoke Abatement Society which is being held at the Science Museum, South Kensington, and closes to-morrow (Saturday).

Mr. A. V. Summers, engineer and manager of Thermega, Ltd., was installed as Master of the Archimedean Lodge, No. 3613, on Tuesday last at the Freemasons' Hall, London, W.C.2.

Mr. W. L. Jones has been appointed a director of Messrs. E. K. Cole, Ltd.

Mr. J. J. Hambidge, for many years director and general manager of the British Vacuum Cleaner & Engineering Co., Ltd., has been appointed joint managing director, and will now share this office with Mr. H. C. Booth.

Mr. A. Hardy, assistant mains engineer of the Leicester Electricity Department, has been appointed to succeed **Mr. M. W. G. Osborne** as mains superintendent of Loughborough at a salary of £437, rising to £454. Mr. Osborne has been appointed to a similar position at Worthing.

Mr. J. M. Donaldson, M.C., M.I.C.E., M.I.E.E., chief engineer to the North Metropolitan Electric Power Supply Co., has had his title changed to general manager, and **Mr. H. S. Selves,** deputy chief engineer, is now chief engineer.

Mr. E. Clark has resigned his position with the Leicestershire and Warwickshire Electric Power Co. to commence in business on his own account in an advisory capacity. His office address is 3, The Crescent, King Street, Leicester.

Mr. H. S. Austin, deputy city electrical engineer at Norwich, has retired from the service of the Corporation, after thirty-seven years' service on reaching the age limit of sixty-five. Mr. Austin commenced his career with the London, Brighton and South Coast Railway as an electrician, and went to Norwich in 1902.

A.S.E.E. Awards.—The examining board has now announced the following results in connection with the W. E. Highfield Shield Competition, 1936, held under the auspices of the Association of Supervising Electrical Engineers:—Shield and members' first prize of £5 5s.: Mr. J. G. Holland, Sind, India, for his paper on "Aerodrome Lighting." Second prize, £3 3s.: Mr. R. Potter, Denton, Manchester, for his paper on "The Development of X-rays." Third prize, £2 2s.: Mr. J. S. Blacklock, Blackburn, for his paper on "Ships' Electric Deck Machinery." Consolation prizes of £1 1s. each have been awarded to the following:—Mr. D. W. Mackie, West Hendon, for his paper on "The Application of Electricity to the Hairdressing Trade"; Mr. H. B. Mellor, Grasscroft, nr. Oldham, for his paper on "Automatic Control"; Mr. W. Acton, London, for his paper on "The Electrification of a Paper Mill."

The shield and prizes will be presented to the successful competitors at the opening meeting of the 1936-1937 session, which will be held at the E.L.M.A. Lighting Service Bureau on October 20th, when the president of the Association will deliver his presidential address. The examining board comprised Messrs. H. Hobson (president), W. E. Highfield (past president), J. M. Crowdy (past chairman of the Association), and W. Lang (a past member of the Executive Council). The prize fund was composed of the following donations:—General Electric Co., Ltd., £5 5s.; St. Helens Cable & Rubber Co., Ltd., £5 5s.; the Telegraph Condenser Co., Ltd., £3 3s.; and Walsall Conduits, Ltd., £3 3s.

Mr. J. Leadbeater, electrical engineer and manager of the Hampstead Borough Council's electricity undertaking, has completed over forty-one years' service and, being over sixty years of age, has requested the Electricity and Lighting Committee to release him from his position as from January 1st next. The Committee is of opinion that Mr. Leadbeater's request should be acceded to, and it will accordingly submit a recommendation to the Finance Committee in due course. At the last meeting of the Council a resolution was passed "that the Council unanimously place on record their great appreciation and acknowledgment of the eminent services rendered to the Council by Mr. J. Leadbeater during the past thirty-nine years, and particularly during the last fifteen years as electrical engineer and manager of the Council's electricity undertaking." Several members spoke in appreciative terms of the service which Mr. Leadbeater had rendered to the undertaking during his long term of office.

[*Elliott & Fry*
Mr. J. Leadbeater

Mr. W. Brown, who has completed thirty-three years' service in the mains department of Tunbridge Wells Corporation electricity works, has been presented, on his retirement, with a semi-hunter watch and a pipe by his colleagues.

Obituary

Mr. H. Bates Thayer, president of the American Telephone and Telegraph Co. from 1919 to 1925, died at New Canaan, Connecticut, recently, aged seventy-eight.

Mr. John Edwards Anger, who came to England as general manager of the United Electric Car Co., Preston, and who played an important part in introducing electric tramways into this country, died at Southport last week at the age of eighty-four. Mr. Anger, who had been retired for a little over twenty years, had not been well for some time following a fall at his home. He came to Preston in 1899, and with his assistance the Electric Car Co. was soon introducing tramway systems into many big cities. Among the overseas systems

started with his aid were tramways in Brussels, the Rhine towns in Germany, Buenos Aires and Johannesburg.

Mr. J. Cunningham.—The death occurred on October 10th in Dumfriesshire of Mr. James Cunningham, retired inspector of the L.N.E. Railway Co. He was formerly in charge of the electrical section in the west and carried through many important electrical schemes.

Sir F. L. MacLeod.—The death is announced of Sir Frederick Larkins MacLeod, which occurred on October 12th in Glasgow, at the age of seventy-eight. Sir Frederick was associated with a number of concerns and was chairman of the British Electric Plant Co.

Will.—Sir Archibald Denny, a director of William Denny & Bros., left estate in Great Britain valued at £103,524.

The Late Walter Rutherford

THE death occurred on October 9th at 37, St. James's Place, London, S.W., at the age of sixty-six, of Mr. Walter Rutherford, M.I.E.E., M.Inst.T., who had been prominently connected with electrical manufacturing traction and large contracting operations for very many years. Cremation took place at Golder's Green on Tuesday.

We are indebted to Mr. V. Watlington, Director of the B.E.A.M.A., for the following tribute to the late Mr. Rutherford:—

"Walter Rutherford was a son of the manse and the youngest member of a brilliant family. His eldest brother, Gunyon Rutherford, was the headmaster of Westminster School and was coupled with the famous Professor Blackie as the greatest Greek scholar of his time. Another brother, Dr. John Rutherford, was the head of the Veterinary Department of the Dominion of Canada.

"After serving an engineering apprenticeship in Cardiff, Walter Rutherford sought an outlet for his abilities in Canada, and, obtaining a post with the Canadian General Electric Co., he acquired much practical knowledge, particularly of electric traction and the problems connected with the installation of electrical plant in out-of-the-way places where the erecting engineer had to depend entirely on his own ability and could not call upon the services of a central organisation. On his first appearance in Canada he was a tall, very thin youth, and when he was sent to Georgetown, Demerara (a notoriously unhealthy place at that time), to install an electrical plant, the committee that met him on arrival intimated quite clearly that they considered he would not last out the job.

"In 1898, when the boom in electric tramways was beginning in this country, Rutherford returned to England and was offered a position in the firm of Dick, Kerr & Co., which was at that time entering the electrical field. Working in close co-operation with George Flett, the then managing director, he assisted in building up a business which, in spite of its relatively slight financial resources, became the most important purely British electrical company in the traction field, and succeeded in obtaining contracts for the installation of electric tramways in all parts of the world. When George Flett was tragically killed in a motor accident in 1910, Rutherford became managing director of the company, which, owing to the increase in competition and the loss of the financial genius and business acumen possessed by George Flett, then passed through rather a difficult time.

"When war was declared in August, 1914, Rutherford, supported by his board of directors, immediately placed the resources of the company at the entire disposal of the Government, and the Preston works was one of the first non-armament firms to commence the manufacture of war material. It was characteristic of Rutherford that there could be no half measures in that or any other important matter, and for four years Dick, Kerr & Co., Ltd., devoted the whole of its energies to the manufacture of munitions, probably thereby losing ground in the purely electrical field.

"In 1918 Rutherford was largely instrumental in forming the English Electric Co., which combined the businesses of Dick, Kerr & Co., Ltd., the Phœnix Dynamo Co., Ltd., Willans & Robinson, Ltd., and the Coventry Ordnance Co., Ltd., a combination which later purchased the Stafford firm of Siemens Brothers Dynamo Works.

"In 1922 he severed his connection with the English Electric Co. and started the Foundation Company, a purely contracting organisation which carried out many contracts, amongst them the erection of that magnificent block of buildings at St. James's Park, which is now the headquarters of the London Passenger Transport Board. Unfortunately, difficulties were encountered in connection with certain foreign commitments, and the company, after a short but brilliant career, was wound up in 1930.

The late Mr. Walter Rutherford

"Shortly afterwards, under the aegis of Messrs. Balfour, Beatty & Co., Rutherford established the Metropolitan Construction Co., Ltd., for undertaking civil engineering contracts in the London area. He was chairman of this company at the time of his death, and a director of Messrs. Balfour, Beatty & Co., Ltd., and the Calcutta Tramways Co.

"Owing to the fact that Rutherford as a young man had occupied positions usually reserved for much older men, most of his close business associates predeceased him, and the death of his wife in 1929 was a blow from which he never completely recovered.

Rutherford had an extremely rigid code of business morality; he never took a mean advantage of anybody, nor did he at any time use his position for personal gain. Those who did not know him well considered him rather gruff, but this was really due to reserve and the fact that he did not make friends easily. Those who did know him well, and had been allowed to see below the surface, knew that he had the kindest of hearts, and that he helped many a lame dog in time of trouble—always anonymously.

"Rutherford was one of the founder-members of the Council of the B.E.A.M.A., of which he was a member from 1912 to 1920, when he became a vice-president. There is no doubt that he played a very important part in the development of the electrical industry in this country during the ten years prior to the War, and he will always be remembered as a strong and courageous personality, and with much affection by those who knew him intimately.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Wireless and Electrical Supplies, Ltd.—Private company. Registered in Dublin on October 3rd. Capital, £2,500. Objects: To carry on the business of manufacturers, producers, importers and exporters of, agents for and dealers in wireless sets and electrical supplies of all kinds, &c. The subscribers are: F. Gordon, "St. Elmo," Knapton Road, Dun Laoghaire, Co. Dublin; and Miss E. Gordon, 11, Spencer Villas, Glenageary, Co. Dublin. F. Gordon is the first director.

Shaw Brothers (Electrical), Ltd.—Private company. Registered October 6th. Capital, £1,200. Objects: To carry on the business of electrical contractors, engineers, sellers of all sound-producing apparatus, radio sets, gramophones, and all electrical appliances, devices and kindred apparatus, &c. The directors are: H. Shaw, 83, Mead's Lane, Seven Kings; and G. H. Shaw, 36, Somersby Gardens, Ilford (chairman). Registered office: 243, Beehive Lane, Ilford.

Rockweld, Ltd.—Private company. Registered October 6th. Capital, £20,000. Objects: To carry on the business of manufacturers of all apparatus, machines and materials appertaining to electric welding, electro-metallurgy, electro-chemistry and production of heat by electricity, &c. The subscribers are: H. Cox and E. T. Horne, both of 31, Old Jewry, E.C.2. Solicitors: Freshfields, Leese & Munns, 31, Old Jewry, E.C.2.

Fax, Ltd.—Private company. Registered October 5th. Capital, £10,000. Objects: To carry on the business of mechanical, electrical and general engineers, &c. The subscribers are: W. J. Turner and F. W. Betts, both of 36, Victoria Street, S.W.1. Solicitors: Burchell, Wilde & Co., 36, Victoria Street, S.W.1.

Fred Reynolds (Electrical Factors), Ltd.—Private company. Registered October 5th. Capital, £4,000. Objects: To carry on the business of manufacturers and dealers in electrical and artificial lighting apparatus, &c. The directors are: F. Reynolds and Mrs. D. Reynolds, both of 571, Foundry Lane, Leeds. Registered office: 17, York Place, Leeds, 1.

Wizard Production Co., Ltd.—Private company. Registered October 5th. Capital, £500. Objects: To acquire the business of accumulator manufacturers and dry battery dealers carried on by H. M. Snelwar, trading as the "Wizard Production Co." at 29, Cannon Street, Manchester. The directors are: H. M. Snelwar and Mrs. R. Snelwar, both of 121, Talbot Road, Old Trafford, Manchester. Registered office: 29, Cannon Street, Manchester.

Pye (Ireland), Ltd.—Public company. Registered in Dublin on October 5th. Nominal capital, £50,000. Objects: To carry on the business of manufacturers and assemblers of and wholesale and retail dealers in wireless and television, transmitting and receiving apparatus and component parts and accessories thereof, gramophones, &c. The first directors are: C. O. Stanley, Lisselane, Clonakilty, Co. Cork, W. Dwyer, Millfield, Blackpool, Co. Cork, and J. P. Digby, 16, Sydney Avenue, Blackrock, Co. Dublin.

Hendersons Radio (East Ham), Ltd.—Private company. Registered October 9th. Capital, £1,500. Objects: To acquire the business of a wireless and radio dealer and electrician carried on by A. C. Henderson at 90, Katherine Road, East Ham, E.6. The directors are: A. C. Henderson, 90, Katherine Road, E.6. and P. J. Warner, 84, Corbetts Tey Road, Upminster. Registered office: 90, Katherine Road, East Ham, E.6.

Prestons (Utilities), Ltd.—Private company. Registered October 9th. Capital, £500. Objects: To carry on the business of electrical and wireless contractors, manufacturers of, agents for and dealers in wireless and television sets, accessories and apparatus, electrical fittings, &c. The directors are: W. H. Preston, 119, Phillips Park Road, Beswick, Manchester, and two others. Registered office: 3, York Street, Manchester.

Returns of Electrical Companies

Everything Electrical, Ltd.—Mortgage on two debts of £596 6s. and £706 1s. 3d., dated September 22nd, 1936, to secure all moneys due or to become due from the company to Barclays Bank Ltd.

Lustre Electric Lamps, Ltd.—Debenture charged on the company's property, present and future, including uncalled capital, dated September 29th, 1936, to secure £500. Holder: N. E. Paine, 66, King Edward's Gardens, Acton, W.3.

Radio & Electrical Equipment Renters, Ltd.—Satisfaction in full on September 30th, 1936, of debenture dated January 3rd, 1935, and registered January 17th, 1935, securing £1,500.

A. P. Lundberg & Sons, Ltd.—Capital, £30,000 in £1 shares. Return dated April 14th (filed July 22nd), 1936. All shares taken up. £30,000 paid. Mortgages and charges, £10,000.

Austinlite, Ltd.—Capital, £6,000 in £1 shares. Return dated May 20th (filed July 29th), 1936. All shares taken up. £6,000 paid. Mortgages and charges, nil.

Criterion Radio Products, Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1935 (filed September 2nd, 1936). 800 shares taken up. £800 paid. Mortgages and charges, £100.

Ashley Accessories, Ltd.—Capital, £2,500 in £1 shares. Return dated December 31st, 1935 (filed May 4th, 1936). All shares taken up. £2,500 paid. Mortgages and charges, nil.

Lincoln Radio Relay Service, Ltd.—The nominal capital has been increased by the addition of £3,000 beyond the registered capital of £6,000. The additional capital is divided into 2,500 ordinary shares of £1 and 2,000 ordinary shares of 5s.

Halifax & Bermudas Cable Co., Ltd.—Capital, £50,000 in 10,000 shares of £5. Return dated May 27th (filed June 10th), 1936. All shares taken up. £50,000 considered as paid. Mortgages and charges nil.

Bude Electric Supply Co., Ltd.—Capital, £30,000 in £1 shares. Return dated June 8th, 1936. All shares taken up. £30,000 paid. Mortgages and charges: £2,500.

Para Electric Railways & Lighting Co., Ltd.—Capital, £780,000 in 390,000 6 per cent. cumulative preference and 390,000 ordinary shares of £1. Return dated July 8th, 1936. 328,000 preference and 390,000 ordinary shares taken up. £25,040 paid on 25,000 preference and 40 ordinary shares, £689,960 considered as paid on 300,000 preference and 389,960 ordinary shares. Mortgages and charges: £458,118.

Seaford & Newhaven Electricity, Ltd.—Capital, £120,000 in £1 shares. Return dated May 14th (filed June 5th), 1936. 90,000 shares taken up. £90,000 paid. Mortgages and charges nil.

City Notes

Baird Television, Ltd., has issued its accounts for a period covering twenty-one months to June 30th last. No income was received by the company other than bank interest and transfer fees, and the profit and loss account shows a debit balance for the period of £138,586, against £49,829 for the preceding fifteen months. This balance has been transferred to general development account, which now totals £443,600. Reorganisation of capital under the scheme of arrangement approved in December last has been carried out. Subsequently an offer of 2,100,000 new preferred shares was made to the shareholders, and this was fully taken up. The directors state that under contract with the British Broadcasting Corporation the equipment for a complete system of high-definition television transmission has been manufactured and installed at Alexandra Palace. The company is manufacturing television receivers for this service, and has a stock in hand to meet the anticipated demand from the public on the opening of the service.

Cables Investment Trust, Ltd., in its report covering the period July 16th, 1935, to June 30th last, reports an income of £273,572, from which are deducted expenses and interest on the debenture stock amounting to £167,847, leaving a balance of £105,725. After payment of the preference dividend and purchasing of £15,000 3½ per cent. debenture stock for cancellation, it is proposed to pay an ordinary dividend of 1½ per cent., leaving £3,102 to be carried forward. At the first annual meeting to be held on October 19th a resolution will be submitted for converting the 4½ per cent. redeemable preference shares and the ordinary shares into stock.

Companies to be Struck off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary: Condor Electric Co., Ltd.; Electric Units, Ltd.; Master Radio & Elecl. Co., Ltd.; Rex Electric Geysers, Ltd.; S. H. Radio Services, Ltd.; Ultra Moderne Radio & Electrical, Ltd.; Universal Electrical Laboratories, Ltd.

Waite & Son, Ltd.—Particulars of this company were published on Wednesday for information only. The company was incorporated on October 12th with an authorised capital of £70,000 in 700,000 ordinary shares of 2s. each, the whole of which has been or is about to be issued. It has been formed to acquire as a going concern as on and from April 1st, 1936, the business of lamp shade, lamp standard, electrical fittings and fancy goods manufacturers carried on by Waite & Son, Ltd.

Murex, Ltd., reports a profit for the year ended June 30th last of £278,741, as compared with £229,393 in the preceding year, to which is added £77,730 brought in, making £356,471. After deducting all expenses, depreciation and tax, and placing £40,000 to obsolescence reserve and £15,760 to investment reserve, there is a balance of £196,668. As announced in our last issue, the final ordinary dividend is 15 per cent., making 25 per cent. for the year (against 20 per cent.), and £33,362 is carried forward. Meeting: October 15th.

Parsons Marine Steam Turbine Co. reports a profit for the year ended June 30th last on manufacturing and royalties account after depreciation and taxation of £20,565, as against £10,361 for the preceding year, to which are added dividends on investments (£12,018), transfer fees (£9), and £32,676 brought in. The dividend for the year is 7½ per cent. and £32,942 is carried forward. In the preceding year the dividend was 5 per cent., plus a bonus of 15 per cent. made out of profits on the sale of investments.

Ransome & Marles Bearing Co., Ltd., reports a net profit for the year ended June 30th of £116,809, which with £26,239 brought in, makes £143,047 available. Reserve receives £50,000, and the dividend for the year is 15 per cent., leaving £35,860 to be carried forward.

Edmundson's Electricity Corporation, Ltd., reports that the results of the operations of its group of companies during September, as compared with the corresponding month of 1935, show an increase of 19 per cent. in kWh sold.

Ericsson Telephones, Ltd., has declared an interim dividend of 6 per cent., tax free, on the ordinary stock (against 5 per cent.).

The Perak River Hydro-Electric Power Co. recommends a dividend of 6 per cent., less tax, for the year ended July 31st. The dividend is the first paid by the company.

The Calcutta Electric Supply Corporation, Ltd., has declared an interim dividend on the ordinary shares of 5 per cent. (actual), free of tax.

The Shanghai Electric Construction Co. is maintaining its interim dividend at 4 per cent., less tax.

The Oriental Telephone & Electric Co., Ltd., is again paying an interim ordinary dividend of 4 per cent., tax free.

Erinoid, Ltd., has announced a final ordinary dividend of 6 per cent., less tax, making 10 per cent. for the year (same).

Babcock & Wilcox, Ltd., are paying an interim ordinary dividend of 4 per cent. (unchanged).

Callender's Cable & Construction Co., Ltd., has announced an interim dividend of 5 per cent., less tax (same).

Stocks and Shares

TUESDAY EVENING.

THE course of Stock Exchange markets runs more slowly this week than it has done of late. To what particular reason this can be assigned, it is difficult to determine. The political situation abroad is held to contain a good deal of combustible matter, while at home the prices of stocks and shares, especially those of investment character, have reached such levels as would seem to leave comparatively little scope for further improvement. Nevertheless, the persistence of the purchasers is an outstanding feature in most of the gilt-edged markets.

Considerable interest is being taken in the stocks and shares of companies operating in those foreign countries where stabilisation of currency might restore conditions of industrial prosperity. It is on this account that substantial rises have occurred in the issues of the Anglo-Argentine Tramways Company, to take an outstanding example. The strength of Brazilian Tractions affords another instance of the result of expectations formed as to what is likely to follow from settlement of the exchange question. Amongst Home industrials, W. T. Henley's ordinary stand out with a 10s. rise. A rush to acquire Morris Motors ordinary shares has been an outstanding item of interest this week.

Electricity Supply Issues

The Electricity Commissioners' official return for September, showing a 15.9 per cent. increase over the 1935 figures in electricity generated during the first three-quarters of the year, produced a slight hardening of prices in the list of Home supply shares. Sixpenny gains are shown by Lancashire Light & Power, 38s. 6d., Llanellys, 26s., and Clyde Valley, 47s. 6d.; British Power & Light hardened to 32s., Southern Areas are easier at 25s. 9d.

The Overseas section presents some good features, with substantial rises in Perak Hydros, now 34s. 6d., and Atlas Trusts, up to 8s. The latter is due partly to reports of important developments affecting the Montevideo Tramway interest. The Perak Hydro Electric Company has fulfilled expectations in declaring a maiden interim of 6 per cent. on the ordinary shares. Calcuttas rose 1s. to 58s. 6d., on maintenance of the interim dividend rate at 5 per cent. Palestine Electric "A" shares, in recovering further from 51s. 6d. to 53s. 6d., responded readily to the more satisfactory local news.

Electrical Equipment Shares

Industrial markets as a whole were greatly cheered by the Chancellor's speech, last week, at the bankers' dinner; prices forged ahead on his declaration that British industrial recovery to date had been largely independent of Government expenditure on armaments. Profit-taking has taken the top off some

of the price-gains, but the tone remains generally firm. Among electrical equipment shares, the most notable price-movement is a ten-shilling jump in Henleys to 77s. 8d. General Electrics and Associated Electrical Industries, although under their best prices, show moderate appreciation. Switchgear and Cowans rose further to 18s. on the strength of encouraging trading reports and of rumoured negotiations for the control of an allied concern. Buoyancy in Chloride Electrical Storage shares, both classes of which are touching £5, is based partly on hopes of an agreement between the leading battery manufacturers to regularise retail trade. Ever Ready are unchanged at 27s. 3d. The telephone group keeps hard, with rises of 1s. 6d. in Halls, to 25s. 6d., and of 9d. in Telephone Manufacturing, to 11s. 9d. Laurence, Scott & Electromotors new "A" shares moved up from 10s. 3d. to 11s. 3d. Among the dull spots are Crompton Parkinsons and Aron Meters, which have shed $\frac{1}{8}$ and $\frac{1}{16}$ respectively. Siemens also are dull at 30s.

Ericsson Telephones

The increase in the Ericsson Telephone interim dividend from 5 per cent. to 6 per cent., free of tax, is generally regarded as a token of a higher total distribution at the end of the current year. The announcement was followed by a reaction of $\frac{1}{16}$ in the price of the 5s. units: considering, however, that the price had risen, in a month, from 53s. 9d. to over £3, this comparatively small set-back is of no particular consequence.

Last year's total distribution of 20 per cent. was made up of 15 per cent. in dividends, and a 5 per cent. cash bonus, all paid free of tax; it was distributed on ordinary capital increased to £375,000 by the 25 per cent. capital bonus of September, 1935. Net profits rose, in that year, from £85,000 to £112,000. In the previous year, 24 per cent., less tax, was paid.

The company's main business, the manufacture and installation of telephone apparatus, is doubtless flourishing under the successful Post Office campaign; useful support is said to be coming from the electric totalisator subsidiaries, as well as from other secondary interests.

Anglo-Argentine Tramways

Revival in the prices of South American stocks was discussed here last week in connection with Brazilian Traction shares. The movement has a double stimulus in the combination of better internal business conditions, and the prospect of greater ease in transferring funds out of the country for the distribution of profits to "foreign" investors.

The junior issues of Anglo-Argentine Tramways Company have joined the movement in spectacular fashion. The £5 First Preference shares, which had been stagnating for many months at about the 1s. mark, sprang upwards to 7s. 6d. in the space of a fortnight: during the same short period, the Second preference quintupled, and the 5 per cent. debenture stock trebled, in price. No interest payment has been made on the last-mentioned since 1931, or on the two preference issues since 1930. The 4 per cent. and 4½ per cent. debentures, quoted now at 37½ and 25 respectively, received their most recent interest payment at the beginning of 1934. Moratoria have been agreed to by all debenture stockholders.

Baird Television

Publication of the Baird Television report coincided with the announcement that the Baird transmitting system will be used next month at the official opening of the B.B.C. television service from Alexandra Palace. The system will be used alternately with the Marconi-E.M.I. system.

The Baird accounts show a total expenditure, for the 21 months' period, of £140,000, most of which is accounted for by experimental and research expenses. The debit balance goes, according to practice, to swell the general development account, which now totals £449,000. A sum of £536,000 stands under the heading of patents, rights, etc., and these two items make up the greater part of the assets side of the balance-sheet. From other items, it appears that the larger proportion of the proceeds from the issue, early this year, of preferred ordinary shares has been utilised; and that additional capital will probably be required before profits from sales of the company's products begin to make their influence felt.

The company's deferred ordinary shares, of 2s. 6d. each, are quoted at 5s. 6d. That they should command a good premium, at this still early stage of television's progress, shows that there are plenty of people ready to endorse the confidence which the company has displayed in laying in a stock of receivers to meet anticipated public demand on the opening of the service.

Miscellaneous Matters

Cable and Wireless preference is 2½ up, at 104½, upon absorption by the speculative investor. A rise of $\frac{1}{16}$ in Marconi Marines has synchronised with a mild boomlet in shipping shares. The fall in Great Northern Telegraphs has been checked, and the price remains at 42½. Gilt-edged stocks show strength unimpaired by the appearance of several newcomers in the British Corporation group. Central Electricity stocks are mostly a point higher. London Passenger Transport "C" stock is on the dull side at 103. Iron and steel shares are irregular in tendency: Babcock & Wilcox went back because some people were disappointed at the interim dividend being again 4 p.c. Rubber shares are attracting no particular attention.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Oct. 13.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	37/–	—	4 1 1
Clyde Valley	1	7	8	47/6	+6d.	3 7 7
County of London	1	10½	10½	55/6	+6d.	3 15 8
Edmundson's 7% Pref.	1	7	7	35/6	—	3 19 0
Do. Ord.	1	8	8	45/–	—	3 11 0
Elec. Dis. Yorkshire	1	9	9	48/–	—	3 15 0
Elec. Fin. and Securities	1	12½	12½	3½	—	4 0 0
Elec. Supply Corporation	1	11	11	60/9	—	3 12 4
Lancs Light and Power	1	7½	7½	38/6	+6d.	3 18 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	39/6	—	4 1 1
London Power Deb. Red.	Stock	5	5	107½	—	4 13 0
Metropolitan	1	10	10	51/6	—	3 17 8
Midland Counties	1	7	7½	41/6	—	3 12 2
Mid. Elec. Power	1	8	8	45/–	—	3 11 1
North Eastern Electric Ordinary	1	6	6	35/6	—	3 7 7
Do. 7% Pref.	1	7	7	36/6	—	3 16 9
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 3
North Met. Elec. Ordinary	1	10	10	58/3	—	3 8 7
Do. do. 6% Pref.	1	6	6	32/6	—	3 13 10
Scottish Power	1	8	8	42/–	—	3 16 2
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	+6d.	6 7 8
Yorkshire Elec.	1	8	8	44/–	—	3 12 9
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	117½	+1	4 5 1
Do. 1955–75	„	5	5	119½	+1	4 3 8
Do. 1951–73	„	4½	4½	112½	+1	4 0 0
Do. 1963–93	„	—	3½	104½	+½	3 7 0
London Elec. Trans. Gtd.	„	—	2½	96	—	2 12 1
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A	„	—	4½	126½	—	3 11 2
Do. do. B	„	—	5	129½	—	3 17 3
Do. do. C	„	3½	4	103	—	3 17 8
West Midlands Joint Elec. 1948–68	„	—	5	115½	—	4 6 7
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	182½	3+	4 18 8
Anglo-Am. Tel. Pref.	Stock	6	6	128½	—	4 13 5
Do. Def.	„	1½	1½	32	—	4 13 9
Cable & Wireless 5½% Pref.	„	4½	5½	104½	+2½	5 5 3
Do. A. 7½% Ord.	„	Nil	Nil	22	—	—
Do. B. Ord.	„	Nil	Nil	6½	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	13½	—	3 4 10
Do. Do. Pref.	10	6	6	14½	—	4 4 3
Great Northern Tel.	10	20	20	42½	—	4 14 1
Marconi-Marine	1	10	7½	37/6	+1/8	4 0 0
Oriental Telephone Ord.	1	12*	12*	3½	—	3 13 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	7/6	+5/9	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	+3/–	—
Do. do. 5% Deb.	Stock	Nil	Nil	15	+5½	—
British Electric Traction Df. Ord.	„	5	5	1625	—	—
Do. do. Pref. Ord.	„	8	8	180½	+1	4 8 8
Brazil Traction	100	—	30 cts.	16½	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	104½	—	4 15 8
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 1st Bonds	$500	5	5	45	—	—
Victoria Falls Ord.	1	20	12	3½	–1/8	3 1 10
West Riding	1	5	6½	50/–	—	2 12 9
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	62/6	–1/8	4 16 1
Assoc. Elec. Ord.	1	6	8	53/–	+1/–	3 0 6
Do. Pref.	1	8	8	39/6	—	4 1 0
Babcock & Wilcox	1	8	8	52/–	–1/9	3 1 6
British Aluminium Ord.	1	7½	7½	41/–	+1/–	3 13 2
British Insulated Ord.	1	15	20	5½	—	3 11 2
Brush Ord.	Stock	Nil	Nil	37½	—	—
Callender's	1	15	15	4⅛	—	3 5 8
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	4½	–½	—
Do. 8% Pref.	1	8	8	2	—	4 0 0
Edison Swan 1st Pref.	1	7½	7½	30/–	—	5 0 0
Electric Construction	1	3½	7	40/–	—	3 10 0
Enfield Cable Ord.	1	25	25	5 1/16	—	4 7 0
English Electric	1	Nil	Nil	26/6	–6d.	—
Do. Do. Pref.	1	Nil	Nil	28/–	+6d.	—
Ericsson Tel.	5/–	24	20*	3	–1/8	1 12 9
Ever Ready	5/–	35	35	27/3	—	6 8 8
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	35/–	—	3 14 4
Do. Ord.	1	10	15	92/6	+6d.	3 4 10
Henleys	1	30	30	7⅞	+½	3 16 2
Do. 4½% Pref.	5	4	4½	5½	—	3 18 3
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	7½	10	52/–	—	3 16 9
Lancashire Dynamo	1	5	10	3	—	3 6 8
Siemens Ord.	1	4	6	30/–	–1/8	4 0 0
Telegraph Construction	£1	Nil	Nil	33/9	—	

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be numbered and abridged and all subsequent proceedings will be taken.

1934

34230. "Electric signalling systems." F. F. Denzler. December 8th, 1933. (453699.)

36494. "Valve amplifier for wide frequency bands such as required in television." Radioakt.-Ges. D. S. Loewe. December 20th, 1933. (453886.)

1935

878. "Interlocking device for the control of electrical systems." Eclipse Aviation Corporation. March 13th, 1934. (453765.)

1545. "Device for use with the dialling plates of automatic telephone instruments." January 16th, 1935. (453826.)

4244. "Electric cables." Telegraph Construction & Maintenance Co., Ltd., J. N. Dean and F. Mattingley. February 9th, 1935. (453598.)

4520. "Electric relays." B. J. Brander. February 23rd, 1934. (453599.)

7682. "Electric heating elements." General Electric Co., Ltd., and J. L. Rycroft. December 30th, 1935. (Addition to 436405.) (453829.)

7693. "Multiple-conductor electric cables insulated with magnesia." Conducteur Electrique Blinde Incombustible. March 14th, 1934. (453770.)

8044. "Transmission of signals to railroad vehicles." Soc. d'Electricité Mors. March 15th, 1934. (Cognate applications 8045/35 and 8046/35.) (453777.)

8132. "Electric irons." Dowsing Co. (Electrical Manufacturers), Ltd., and F. W. J. Cripps. March 15th, 1935. (453839.)

8188. "Radio receivers." Hazeltine Corporation." April 25th, 1934. (453653.)

8207. "Electric power cables or power-cable systems." Okonite Co. March 16th, 1934. (453840.)

8242. "Electric condensers." Porzellanfabrik Kahla. March 17th, 1934. (453707.)

8264. "Electric cables insulated with magnesia." Conducteur Electrique Blinde Incombustible. March 20th, 1934. (453779.)

8271. "Wireless and like receivers." W. H. Connell. March 16th, 1935. (453841.)

8276. "Radio and other high-frequency circuit arrangements and electrical filters for use therein." Marconi's Wireless Telegraph Co., Ltd., and N. M. Rust. March 16th, 1935. (453842.)

8347. "Electrical musical instruments." J. Compton Organ Co., Ltd., and L. E. A. Bourn. March 18th, 1935. (Addition to 403444.) (453846.)

8355. "Band-pass filters for use in the reception or transmission of radio signals." L. R. Merdler and Baird Television, Ltd. March 18th, 1935. (453847.)

8356. "Television and like systems.' T. E. Bray and Baird Television, Ltd. March 18th, 1935. (453848.)

8442. "Thermionic valve oscillator arrangements." Marconi's Wireless Telegraph Co., Ltd., and D. F. George. March 18th, 1935. (453852.)

8554. "Electric circuit-breakers." A. Reyrolle & Co., Ltd., and A. Allan. March 19th, 1935. (453857.)

8563. "Electric immersion heaters." P. Wicks. March 19th, 1935. (453781.)

8570. "Noise-suppression and tuning-correction in radio receivers." Murphy Radio, Ltd., and G. B. Baker. March 19th, 1935. (453858.)

8599. "Alternating electric current motors." British Thomson-Houston Co., Ltd., and A. H. Maggs. March 19th, 1935. (453862.)

8600. "Electric-discharge devices." British Thomson-Houston Co., Ltd., H. de B. Knight and L. J. Davies. March 19th, 1935. (453863.)

8623. "Photo-electric exposure meter" Metrawatt Akt.-Ges. March 23rd, 1934. (Cognate application 8624/35.) (453864.)

8707. "Direct-current electricity meters." United Gas Industries, Ltd., and H. E. Angold. March 20th, 1935. (453874.)

8776. "Flicker-producing devices for use in connection with electric fires of the imitation coal-fire type." V. W. Gilbert. March 21st, 1935. (453878.)

8890. "Braking systems for electric motors." British Thomson-Houston Co., Ltd., H. W. C. Liddiard and T. H. Petch, jun. March 21st, 1935. (453882.)

8899. "Electrical circuits for integrating and differentiating electrical variations." E. S. L. Beale and R. Stansfield. March 21st, 1935. (Cognate application 11278/35.) (453887.)

9268. "Frequency-determining means." British Thomson-Houston Co., Ltd. March 24th, 1934. (453922.)

9971. "Evacuating systems." F. E. B. Bancroft and Metropolitan-Vickers Electrical Co., Ltd. March 30th, 1935. (453608.)

10583. "Rail vehicles such as tramcars." English Electric Co., Ltd., and W. L. Marshall. April 5th, 1935. (453609.)

10726 "Electric motor for driving sewing-machines and the like." G. Kent, Ltd., and D. R. A. Pistor. April 6th, 1935. (453713.)

13762. "Dynamos and application thereof to cycles for lighting purposes." L. T. Watson. May 10th, 1935. (453616.)

15515. "Electrical contacts or coupling members for distribution boards for feeder pillars and the like." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. May 28th, 1935. (Cognate application, 2400/36.) (453719.)

17609. "Portable wireless receiving-sets." High Vacuum Valve Co., Ltd., and D. W. Sayers. June 19th, 1935. (453620.)

19515. "Electron-discharge devices." Telefunken Ges. für Drahtlose Telegraphie. July 6th, 1934. (453722.)

19919. "Lift-controlling systems." General Electric Co., Ltd., and N. C. Smart. July 12th, 1935. (453723.)

21679. "Drilling machines having electric feed mechanism." R. Herrmann. July 31st, 1934. (453800.)

22149. "Trolley heads and wheels of overhead electric traction." H. C. Godsmark. August 6th, 1935. (453670.)

23252. "Locking devices for suspended electric lamps." Aktieselskabet Elektrisk Bureau. August 23rd, 1934. (453724.)

24178. "Electrical plug-connectors." T.M.C.-Harwell (Sales), Ltd., and G. W. Laxton. August 29th, 1935. (453801.)

27202. "Carrier-wave modulating systems." British Thomson-Houston Co., Ltd. October 4th, 1934. (453732.)

27265. "Electric condensers." R. Bosch Akt.-Ges. October 8th, 1934. (453628.)

27685. "Method of and means for electrical tele-communication by means of ultra-short waves." Naamlooze Vennootschap Machinerieen en Apparaten Fabrieken Meaf. October 27th, 1934. (453733.)

35742. "Circuit arrangement for regulating stage-lighting installations." Siemens Schuckertwerke Akt.-Ges. June 8th, 1935. (453735.)

35979. "Radio receiving-apparatus for use on automobiles." Marconi's Wireless Telegraph Co., Ltd. December 29th, 1934. (Cognate application 35980/35.) (453736.)

1936

1487. "Motor devices for colour light signals." General Railway Signal Co. February 21st, 1935. (453737.)

4823. "Device for the step-by-step tuning of apparatus for the high-frequency electrical transmission and reception of intelligence." F. Schwarzer. April 11th, 1935. (Cognate application 4824/36.) (453816.)

6415. "Electromechanical wave filters." Standard Telephones & Cables, Ltd. April 20th, 1935. (453748.)

9905. "Electric immersion heaters." British Thomson-Houston Co., Ltd. April 10th, 1935. (453753.)

9906. "Electric immersion heaters." British Thomson-Houston Co., Ltd. April 10th, 1935. (453754.)

14231. "Photo-electric exposure meters." Metrawatt Akt.-Ges. June 1st, 1934. (Divided out of 453864.) (453913.)

15459. "Radio and other transmitter installations." Telefunken Ges für Drahtlose Telegraphie. June 1st, 1935. (453759.)

17133. "Electric transformers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 25th, 1935. (453762.)

17230. "Heating-shelves for cordless electric irons." Dowsing Co. (Electrical Manufacturers), Ltd., and F. W. J. Cripps. March 2nd, 1936. (Divided out of 453839.) (453916.)

Trade Mark Applications

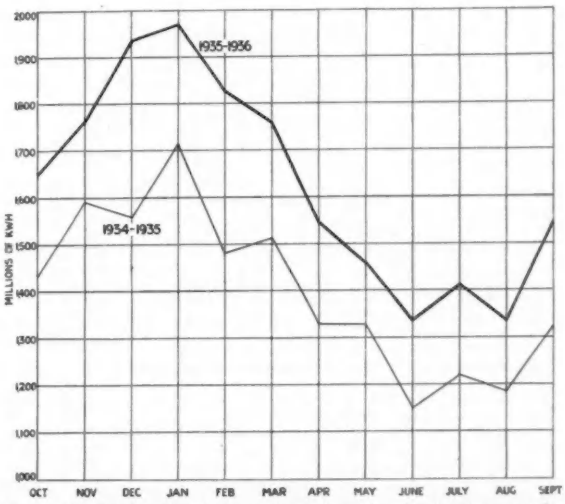
The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 8th :—

Welstern. No. 568392. Class 6. Electrical machines and parts thereof. No. 570825. Class 13. Metal goods.—Herbert Edward Webster, trading as the Welstern Electric Co., 21, Peel Place, Bradford, Yorks.

Souplex. No. 571155. Class 6. Hairdressers' machines and parts thereof.—I. Calvete, Ltd., Icall Works, North Street, Clapham, S.W.4.

Generation of Electricity in September

THE official returns rendered to the Electricity Commissioners show that 1,544 million kWh of electricity was generated by authorised undertakings in Great Britain during September, as compared with the revised figure of 1,321 million kWh in the corresponding month of 1935, representing an increase of 223 million kWh, or 16.9 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was 26, as against 25 last year.



The output of authorised undertakings in the twelve months to the end of September, with comparative curve for 1934-35

During the first nine months of 1936 up to the end of September the total quantity of electricity generated by authorised undertakings was 14,169 million kWh, as compared with the revised figure of 12,230 million kWh for the corresponding period of 1935, representing an increase of 1,939 million kWh, or 15.9 per cent.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Cinema, Broadway, for the Broadway Cinemas; Normanton's, Ltd., builders, 167, Plymouth Grove, Chorlton-on-Medlock, Manchester.

Alderley Edge.—Houses (20); U.D.C. surveyor.

Baillieston.—Houses (96), Garrowhill Garden estate; Henry Boot (Garden Estate), Ltd.

Barnsley.—School of Art for E.C.; Dyson, Cawthorne & Coles, architects, Regent Street.

Bingley.—Factory, Crossflats, for Courtaulds, Ltd., St. Martin's-le-Grand, London, E.C.1.

Birkenhead.—Houses (69), Woodcote estate, Old Chester Road; Brown & Saunders. Junior school, Moreton Road; borough engineer.

Birmingham.—Houses (109), Weoley Castle estate; Asphalte & Public Works, Ltd. Factory, Alcester Street, for Fisher & Ludlow, Ltd., Rea Street; W. J. Whittall & Son, Lancaster Street.

Blackpool.—Houses (32), Drakelowe Avenue; Staunton & Co.

Bolton.—Houses (196), Hulton Lane estate, for the Housing Committee; V. M. Hughes, housing director, Westminster Bank Chambers.

Boston.—Houses (224); Mollekin Bros., builders, Maltby, Rotherham.

Bradford.—Aerodrome (£43,000); borough engineer.

Bridgwater (SOMERSET).—Houses (116); James Sanderwick & Sons, builders.

Brighton.—School clinic and infant welfare centre, Sussex Street; Thos. Simpson & Son, architect, 16, Ship Street.

Bristol.—Church, Charfield Road, Southmead; Baptist trustees.

Bromley (KENT).—Houses (66), Bromley Manor estate; Williams & Phillips, Ltd.

Caernarvonshire.—Schools, Gyffin; director of education, Caernarvon.

Canterbury.—Central stores, for the Co-operative Society; secretary.

Cheltenham.—Houses (300), Whaddon Farm estate; borough engineer. Hostel, Fulwood Park; St. Mary's College, governors. Junior school, Whaddon Farm estate, for E.C.

Chichester.—Gaumont Palace Cinema (£30,000), electrical work; H. Weston, architect.

Cirencester.—Cinema, Lewis Lane (£25,000); H. F. Scott, architect.

Conway.—Electricity showrooms and stores, Llandudno Junction; borough surveyor.

Devonshire.—Extensions to Exmouth Grammar school (£21,000), for County E.C.; county architect, Exeter.

Dewsbury.—Houses (256), Dewsbury Moor site; borough architect.

Doncaster.—School, Waverley, for Borough E.C.; Walker & Thompson, architects.

Douglas (ISLE OF MAN).—Houses (30), Onchan, for Thompson & Bridson.

East Retford.—Senior girls' school, West Furlong; S. Allen, architect, Municipal Offices.

Essex.—School, Braintree; J. Sargent, director of education, Chelmsford.

Feltham.—Factory, for the Paper Cap Manufacturing Co., Ltd., Hampton Road, Hanworth.

Folkestone.—Town hall and municipal buildings and houses, Cheriton; borough surveyor. Houses (67), Hill Road estate; Thomas Clayson & Son, builders, Lyminge.

Gateshead-on-Tyne.—Houses (36), Kyle Road, for the Church Army, London; Gibson Bros., builders, Hill Heads, Whitley Bay. Extensions to works, Powells Products, Ltd.

Great Yarmouth.—Houses (30); borough engineer.

Hampshire.—Senior school, Havant; county architect.

Hastings.—Flats and shops, Tivoli estate, Battle Road; Fryer & Sons.

Hereford.—Church, Hinton Court estate; Baptist Church trustees. School, Hinton Court (£21,897); James Hiles & Son.

Higham Ferrers.—Houses (46), North End; A. E. Lloyd, surveyor.

Hull.—Extensions to works, for the Ideal Boiler & Radiators, Ltd., National Avenue, Perth Street.

Irish Free State.—(CASTLETOWNBERE, Co. CORK).—Power house and installation of electric lighting, Castletownbere Cottage Hospital, for the West Cork Board of Health, Clonakilty, Co. Cork; J. J. O'Crowley, engineer, Clonakilty.

Keighley.—Houses (80), Hebden Bridge Road, Uppertown and Moorhouse Lane; J. B. Bailey & Sons, architects, Devonshire Buildings.

Kilmarnock.—Cinema, Sturrock Street (£50,000), for F. Booth; A. Inglis, solicitor.

Lancaster.—Houses (45), Vale estate; R. L. Dilworth, Ltd., builders, Damside Street.

Leamington.—Extensions to Warneford hospital (£20,000), including maternity block; secretary.

Leeds.—Estate development near Dartmouth Road, Hunslet; Clayton, Son & Co., Ltd. Hostel, Beeston Road (£53,523); N. B. Bell & Co., Ltd.

Liverpool.—Factory, Speke Hall Road, for Manisty Machines, Ltd., covering 30,000 square feet of floor space; A. E. Shennan, architect, 14, North John Street. Large buildings, Aintree (£200,000), for the directors, Littlewood's Mail Order Stores, Ltd. (J. Moores, director), Littlewood Building, Old Hall Street; H. J. Rowse, architect, Martins' Bank Buildings, Water Street. Technical college, on part of the Botanic Gardens (£200,000), for E.C.

Llanelly.—Houses (350), Llied Valley; J. H. Montgomery, borough surveyor.

London.—(BRIXTON).—Cinema (£75,000), Brixton Road, for the Gaumont British Picture Corporation, Ltd., Film House, Wardour Street, W.1.

Marple.—Houses (64); Harris Bros., builders, Derby.

Monmouthshire.—School, Malpas; director of education, Newport.

Newcastle-on-Tyne.—Houses (28), Dipton Avenue; J. Gold & Sons, builders, Clayton Street. Branch stores, Benton Road, for the Newcastle Co-operative Society; C.W.S. Architects' department, 90, Westmorland Road. Extensions to premises, Warwick Street, for Motor Bodies, Ltd.; Marshall & Tweedy, architects, 129, Pilgrim Street.

Northampton.—Houses (123), Spencer estate (£43,686); Bainbridge (Builders), Ltd. Extensions to works, Balfour Road; Northampton Machinery Co., Ltd.

Northenden.—Factory, for Keates, Brown & Co., Ltd., Manchester.

Oldbury.—Houses (35), Parkfield Road; J. C. Freeman & Sons.

Perth.—Houses (596), Dunkeld Road; burgh surveyor.

Plumpton (SUSSEX).—Extensions, including laboratories, lecture room, &c. (£20,000), East Sussex School of Agriculture; E. A. Verger, architect, Lewes.

Ramsgate.—Houses (87), Dumpton; A. Adlington, borough engineer, 16, Albion Place. Two schools (£31,000); director of education.

Reading.—Cinema, Oxford Road, for Mrs. M. A. Simmons, Sunshine Corner, Beenham.

Redditch.—Extensions to Standard works; S. Allcock & Co., Ltd.

Rochester.—School, Strood, for E.C.

Rotherham.—Houses (200), (£90,000), and extensions to Council offices (£30,300); borough engineer. Extensions to works, Don Street; Guest & Chrimes, Ltd.

Rowley Regis.—Civic centre (£41,750); S. A. Griffiths, architect, Stourbridge.

Sanquhar.—Houses (74), Renwick Place; W. Rae, burgh surveyor, Town Buildings.

Scarborough.—Houses and flats, Ebenezer Place; A. F. Stephenson. Shops, &c., Valley Bridge Road, for H. Whitaker, and additions to the Ramsdale Private Hotel; Jones & Rickaby, architects, 102, Westborough.

Sidcup.—Buildings, Little Birches, for Fairlawn & Longlands Horticultural Society.

Sidlesham (SUSSEX).—Houses (50), Batchmere, for the Land Settlement Association, Ltd.; Pakington & Enthoven, architects, 2, Bedford Square, London, W.C.1.

Skegness.—Dance hall and restaurant, adjoining the Parade Cinema, Grand Parade, for Hannam's Mansions, Ltd. (G. Hannam, managing director), Lumley Street (£25,000); Drury & Reekie, architects, Gower Street, Bedford Square, London, W.C.1.

Southall.—Nineteen shops and flats, South Road; Prices Tailors, Ltd.

Southend-on-Sea.—School, Belfairs estate, for E.C.

Southport.—Law courts, police and fire stations, &c. (£80,000); S. N. Cooke & R. Dickinson, architects.

Stoke-on-Trent.—Block of offices, for Stoke Central Offices, Ltd. (£30,000); Wood & Goldstraw, architects, Town Hall Chambers, Tunstall.

Stourbridge.—Houses (90), and bungalows, Wollescote; F. Woodward, borough engineer.

Stretford.—Houses (36), Norwood Road; A. Locke, Ltd., builder, Lostock Road, Davyhulme.

Tipton.—Houses (76), Tibbington estate; Wm. Whittington. Works, Castle Street; Galvo Co., Ltd.

Todmorden.—Medical centre, Ridgefoot; Abraham Omeroid trustees. Two schools; J. E. Stott, architect. Extensions to cabinet works, Ramsden Wood Road; E. Sutcliffe & Sons. Extensions to Clough Fireclay works, Bacup Road; F. & J. H. Tamperley, Ltd.

Trowbridge.—Reconstruction of Palace Theatre, electrical work; manager. Cinema, Bythesea Road, electrical work, for Regal (Trowbridge), Ltd.; secretary.

Tunbridge Wells.—Houses (162); borough surveyor.

Wakefield.—Houses, Darnley estate and Gill Sykes estate; housing architect. Houses (20), Peacock Farm estate; G. Crook & Sons, Ltd. Extensions to works, Calder Vale Road; Yorkshire Press & Tool Co., Ltd. Extensions to Economiser works, Calder Vale; E. Green & Son, Ltd.

Wallsend-on-Tyne.—Maternity hospital, Willington Quay, for the Northumberland Nursing Association; Stanley Miller, Ltd., builders, 17, North Street, Newcastle-on-Tyne.

Walsall.—Girls' school, Mayfield site, Sutton Road (£35,000); Grammar School governors.

Walthamstow.—Houses (£41,000); borough surveyor.

Welwyn Garden City.—Houses (110); C. W. Fox & T. Smith Shearer, architects, 3, Southampton Street, London, W.C.2.

Westgate-on-Sea.—Senior school (£32,000), electrical work; W. R. H. Gardner, architect, 9, Cecil Square, Margate.

Weymouth.—Technical and art school, Newstead Road (£30,000); director of education.

Wigan.—Cinema, Atherton Road, Hindley, for Livesey & Hall; W. A. Whittle, architect, 68, Church Road, Bolton.

Wiltshire.—Senior schools, Melksham, and secondary school, Chippenham; director of education, Trowbridge.

Winchester.—Houses (22); city surveyor.

Worcestershire.—Police station buildings, Lye, for C.C.; Standing Joint Committee.

Workington.—Houses (84), Frostams and Westfield estates; Thomas Armstrong Ltd., builder, Lowchurch Street.

Worthing.—Houses (61), Lindum Road; Willmore Phillips, Ltd. Houses (28), Stone Lane; Boxall & Stracey.

Yorkshire.—Senior school, Castleford, for West Riding E.C.; education architect, Wakefield.